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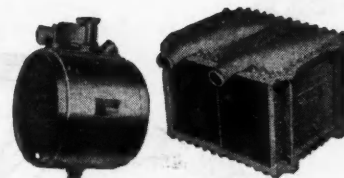
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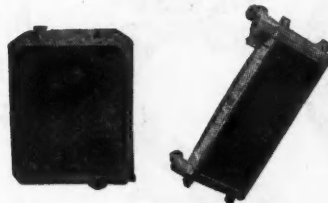
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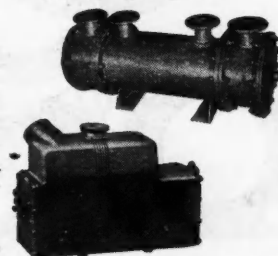
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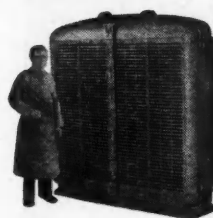
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The Death-Dealing Demands of CIO

By Dr. Willford I. King

Professor of Economics, New York University and
Chairman, Committee for Constitutional Government, Inc.

JUST as problems of reconversion are at their height, just as employees by the thousands are being dismissed from war plants, the United Automobile Workers Union, a leading CIO member, launches its campaign against the motor industry. The major demands comprise a 30 per cent wage increase, an annual guaranteed wage, vacation pay, and pensions. Various minor requirements are added for good measure. The United Automobile Workers start their campaign with a \$4,000,000 war chest and they expect the CIO treasury to supplement this to any extent necessary. They promise that, if their demands are not granted, they will first tie up General Motors and later the other automobile companies.

Presumably the CIO begins its campaign in the motor car field because this is the industry that everyone expects to set the pace in providing reemployment for war workers, and because it believes that the demand for automobiles is so strong that wage increases can readily be passed along to the consumers. However, R. J. Thomas, UAW president, justifies the action by demanding "that the great profits made by the industry be used to create full employment."

That this is mere camouflage is indicated by the figures on profits in the industry as reported in the *Survey of Current Business* put out by the United States Department of Commerce. The issue for July, 1944, shows that, for all automobile manufacturers, total profits after taxes were \$381 millions in 1940 and \$432 millions in 1943, an increase of only 13 per cent. Profits of 15 large companies were in the first quarter of 1945 about 15 per cent higher than in the first quarter of 1943. This would indicate an increase of about 30 per cent.

However, net earnings per common share for General Motors were only \$3.68 in 1944 as compared to \$4.45 in 1941 while the net for Chrysler was but \$5.70 per share in 1944 as compared to \$9.22 per share in 1941. Therefore, the statement that the big companies are making exorbitant profits seems contrary to the facts.

In December, 1941, average hourly earnings in the automobile industry were \$1.11—the highest of any industry recorded by the U. S. Department of Labor. The average for all manufacturing industries was only \$0.79. In May, 1945, the average hourly earnings in the automobile industry stood at \$1.27, an increase of 14 per cent. Now it is proposed to push the rates 30 per cent higher, and then add allowances for vacation pay, pensions, etc.

The wage increase cannot well be taken out of profits for, in 1941, the last year when the automobile concerns were operating normally, profits after taxes, amounted to but \$378 millions, while wage and salary payments totaled \$1,469 millions. Thirty per cent of the latter figure is \$441 millions, a sum apparently approximating the current net profit total. Since companies cannot long operate

(Turn to page 120, please)

Measure of a good spring

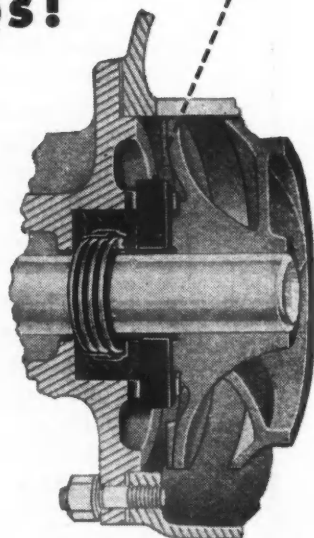


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Plant Expansion

*of Automobile Companies
on Big Scale with Outlay
Near \$1 Billion*

By Leonard Westrate

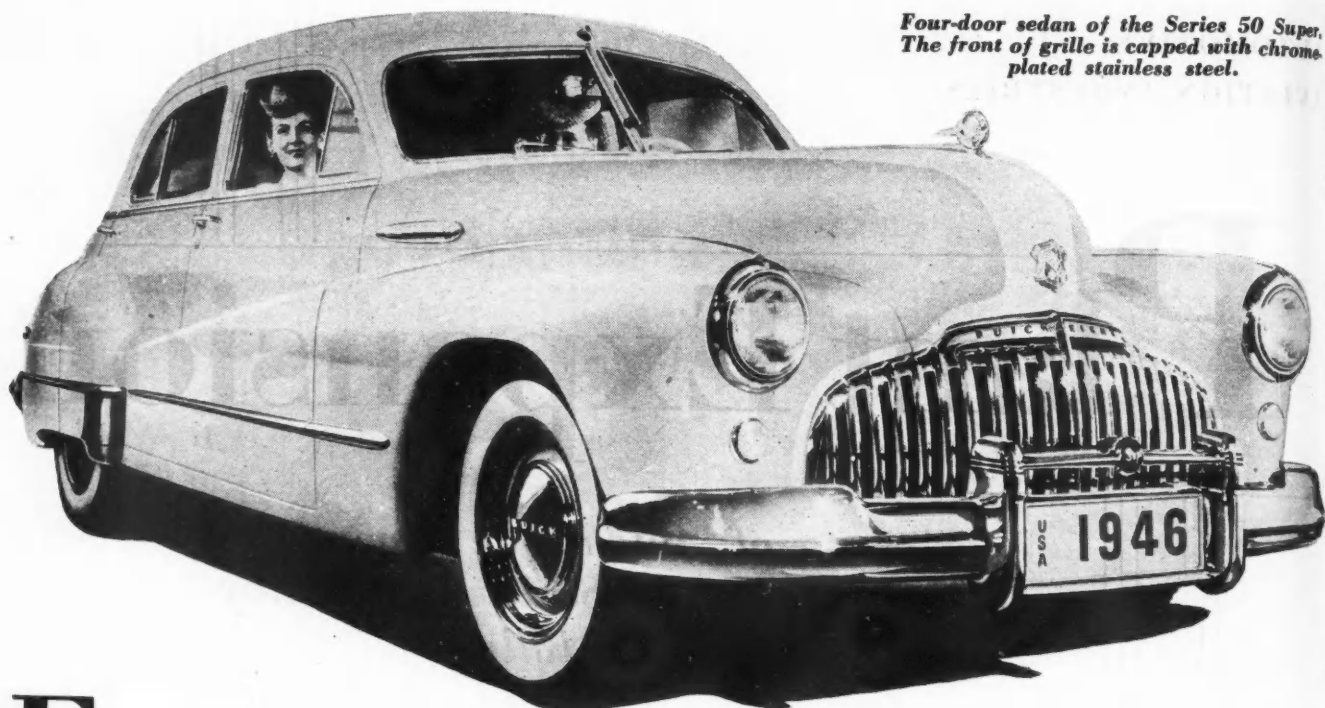
AMID labor turmoil, uncertainty about the extent of Government regulation of peacetime industry, and talk of the "flight of capital," the automobile industry is underwriting its faith in this nation's future by going resolutely ahead with the greatest expansion and rehabilitation program in its history.

Industry leaders know that the period ahead will be one of unparalleled prosperity—provided that organized labor does not strip the gears of the economic machine by unreasonable demands and prolonged strikes. The dammed-up need for automobiles and trucks after a four-year famine will demand a torrent of production, and the automotive industry is willing to plough back between \$750 million and \$1 billion to bring it about. Another factor to consider is that now is the golden time to make improvements and modernizations that were needed long before the war, but which never were made because it was more economical to use obsolescent facilities than to go out of production long enough to install new ones. It would now be unthinkable to restore these installations to their original status, so the forced disruption of car production will result in many companies making renovations and improvements that were long overdue.

General Motors alone plans to spend \$500 million on its immediate expansion and rehabilitation program. Ford Motor Co. announced several months ago that it would lay out \$150 million and recently stepped up the amount for expansion projects to \$175 million. Chrysler Corp. is understood to have at least \$100 million earmarked for expansion purposes. The independents, of course, have much more limited budgets, but in the aggregate, their expenditures for postwar improvements and enlargements will total to a respectable sum.

While GM shies away from any dollar figures in discussing plans for its various divisions, there is ample evidence that the lion's share is to go for plant expansion and facilities. Chevrolet Division is erecting at Flint a five-unit plant on a 100-acre site. The main assembly plant will contain 1.1 million square feet of manufacturing space—more than 25 acres—and will include a body building section to be operated by Fisher Body. Capacity of the plant will be 600 cars and trucks each 8-hour shift. Other units will be an office building, enclosed loading dock, customers' delivery building, and power plant. The old assembly plant, together with manufacturing plants adjacent to it, will be retained for manufacturing engines, pressed metal components, and parts. Moving out of assembly from this group of plants will relieve congestion which had been severe for several years before the war, and will provide for increased production of assemblies needed for the expected boost in Chevrolet production. Although no official figures on production goals have been revealed, it is understood that Chevrolet, which led the field for several years before the war, is prepared to meet the challenge laid down by Ford, which has announced it is shooting at 8000 cars and trucks per day when full production is achieved. Chevrolet is reported to be quietly laying plans for production as high as 9000 daily if

(Turn to page 102, please)



Four-door sedan of the Series 50 Super. The front of grille is capped with chrome-plated stainless steel.

FOR the 1946 model year the Buick Division of General Motors Corp. has announced three lines of eight-cylinder cars—the Series 70 Roadmaster on 129-in. wheelbase, the Series 50 Super on 124-in. wheelbase and the Series 40 Special on 121-in. wheelbase. These are continuations of the series bearing those numbers in 1942 and are essentially the same as the corresponding 1942 models, but incorporate interesting appearance changes and numerous improvements in materials and design details.

The Series 50 Super cars, first to come off Buick's postwar assembly line, will be in four body types—

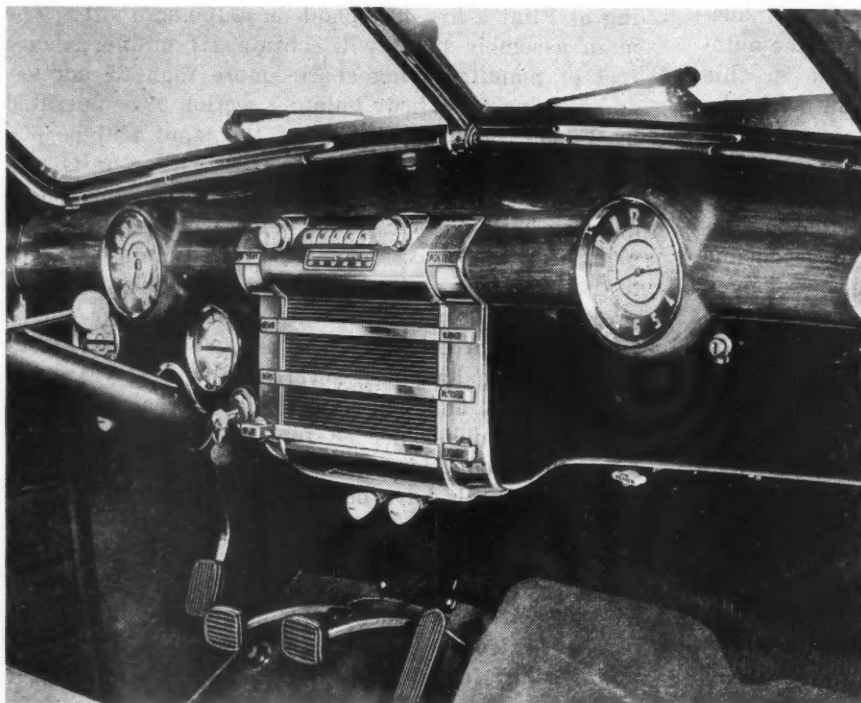
Buick

Model 51 six-passenger, four-door sedan; Model 56S six-passenger two-door sedanet; Model 56C six-passenger convertible coupe with full rear seat and automatic top, and Model 59 six-passenger estate wagon. Initial output encompasses the four-door sedan and estate wagon, with other body types scheduled early in production.

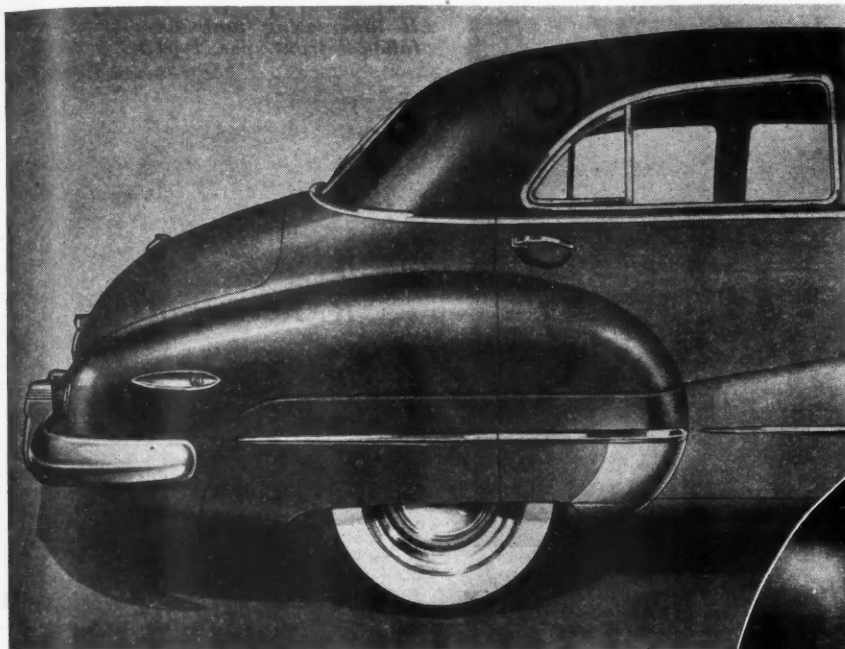
The Series 70 Roadmaster will have three body types—Model 71 six-passenger four-door sedan; Model 76S six-passenger, two-door sedanet; and Model 76C six-passenger convertible coupe with full rear seat and automatic top.

The Series 40 Special cars will be in two body types, the Model 41 six-passenger four-door sedan and the Model 46S six-passenger two-door sedanet, and will come into production following the Roadmaster series.

The engine for the Series 40

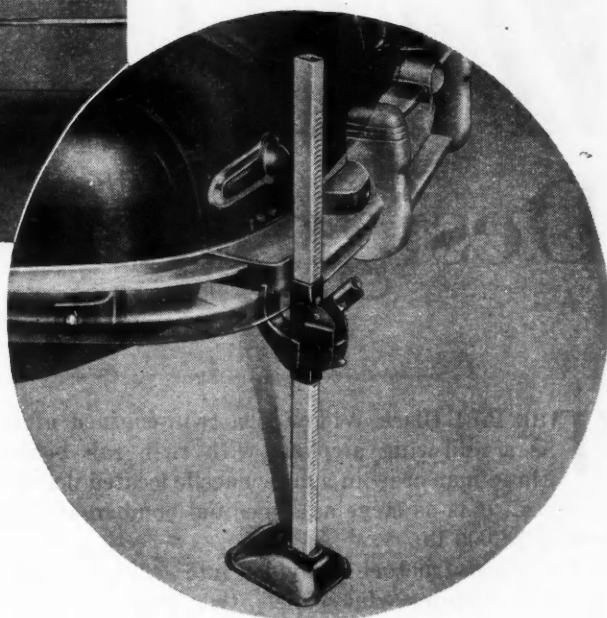


Buick's new instrument panel has a tan or grey oak finish to harmonize with the interior. The new step-on parking brake is located at the extreme left of the driver's compartment. Light pressure with the toe engages this parking brake. It is locked by pushing the small hand control on the left corner of the dash and released by pulling this same knob.



(Left) New fender wheel shield and stainless steel gravel deflector in the Buick 1946 design. The wheel shield has concealed bolts with front bolt inside door opening to make removal impossible when the door is locked.

(Circle) Phantom view showing the method of applying the new bumper jack with a lifting bracket that straddles the bumper back jack.



to Build Three Models Introducing Numerous Mechanical and Style Improvements

and Series 50 is the 8-cyl, valve-in-head, 3 3/32 in. bore by 4 1/8 in. stroke, 248 cu in. displacement, rated 110 hp at 3400 rpm. The engine for the Series 70 is 8-cyl, valve-in-head, 3 7/16 in. bore by 4 5/16 in. stroke, 320.2 cu in. displacement, rated 144 hp at 3600 rpm.

The respective engines for these models have certain changes in common. Using improvements in production technique, cylinder blocks are precision-bored, then finished with a new type hone which gives exceptional accuracy and finish. Following honing the barrels are Lubrite-coated which is a manganese-phosphate treatment to seat the rings and provide protection against scuffing during initial run-in on the test stand. Water circulation has been changed to provide more uniform cooling. The chamfer at the top of the cylinder bore is 20 deg instead of 45 deg to facilitate installation of rings. For 1946 both engines will have aluminum alloy pistons with anodized surface finish. The rings are the same as previously employed but will not have surface coating since the purpose of the coatings is now fulfilled by the Lubrite-coated cylinder barrels.

Inverted flared tube fittings are used on all oil and vacuum lines except the 1/8 in. lines. The oil filter has been removed as standard equipment. The water pump

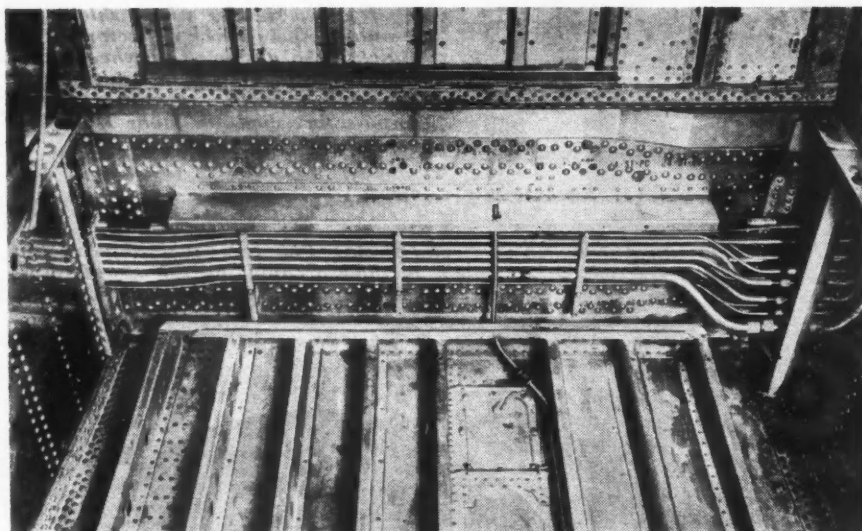
seal is changed to carbon block. The clutch has been refined by the addition of a spring to prevent wear between the clutch release bearing. Valve rocker arms are Lubrited, permitting the elimination of copper plating of the rocker arm shaft. Rocker arm brackets return to die cast aluminum as in 1941.

The spark plug setup has been improved by the adoption of the AC 14 mm Model 48 with an aluminum oxide insulator. Because of inherent design it provides a hotter plug at low speed operation thus preventing fouling. At high speeds its characteristics are such that pre-ignition is eliminated.

The carburetor is of dual type instead of the double compound units formerly employed, the intake manifold being redesigned to accommodate the change. An automatic choke is built integrally with the carburetor, its operation being governed by intake vacuum and a thermostatically controlled spring. A fast idle cam, operating in conjunction with the choke automatically provides proper throttle opening for starting the engine when cold.

In the front suspension knee action system the lower control arm inner shaft and bearing are new, having threaded sleeve type bearings with grease seals. This setup also is available for servicing older models. In the rear suspension system and axle the following de-

(Turn to page 62, please)



*LH inner wing tank bay—
inboard front spar, P-61B.*

By

R. R. Nolan

Assistant Factory Manager,
Northrop Aircraft, Inc.

Design and Production of

THE P-61 Black Widow is a twin-engined night interceptor. It is a mid-wing airplane with twin tail booms, and carries a three-man crew in a crew nacelle located between the two engine nacelles. It is as large as a medium bomber, its gross weight being nearly 28,000 lb.

The wing structure is divided into seven sections; two inner wing panels, two outer wing panels, two wing tips, and the crew nacelle section (spars only). The complete assembly, except tips, is of riveted aluminum alloy, stressed skin, full cantilever construction with the loads concentrated on two main spars. Wing tips are constructed of welded magnesium alloy. The wing skin is arranged to carry the chord bending and torsional loads and is supported by chordwise ribs and stiffeners.

Each inner wing panel is bolted to the crew nacelle section spars at the top and bottom of each spar. The panel contains an engine nacelle, two fuel tanks and a section of the wing flaps. It is built in three sections; the nose section (including air intake ducts), the main section (including the two spars), and the detachable trailing edge section (including the wing flap).

Each outer wing panel is bolted to its inner wing at the top and bottom of each spar. Each panel contains the oil tank and cooler, the wing flaps, spoiler panels, aileron, landing light, provision for leading edge de-icer shoe attachment, and recognition lights (right wing only). The outer wing is built in three sections; the nose section (including air intake ducts), the main section (including the two spars), and the detachable trailing edge section (including aileron, spoiler and wing flap).

Each wing tip is fastened to its outer wing by bolts through internal attaching angles. Each tip contains one position light and two covered holes (lower surface) for access to the attaching bolts.

Each outer wing panel contains a conventional type aileron about one-fourth the size normally required for an airplane the size and weight of the Black Widow. This small aileron functions in conjunction with the Northrop retractable aileron which plays from zero to approximately seven in. above the top surface of the wing and aft of the rear spar.

The wing flaps are much larger than those of the average airplane

Major component assemblies.

- 1—Crew nacelle forward and intermediate sections
- 2—Door assembly—Nose wheel
- 3—Nose assembly—crew nacelle
- 4—Pilot's windshield
- 5—Pilot's enclosure panel
- 6—Pilot's hinged canopy
- 7—Gunner's enclosure
- 8—Enclosure—rear hinged
- 9—Enclosure—rear fixed
- 10—Radio operator's windows
- 11—Cone assembly—crew nacelle rear
- 12—Electrical gun turret
- 13—Crew nacelle turret assembly
- 14—Crew nacelle aft section
- 15—Radio operator's door
- 16—Inner wing tank panel
- 17—Engine nacelle—forward lower panel
- 18—Cover assembly inboard
- 19—Cover inner wing fuel tank
- 20—Stub wing inboard
- 21—Stub wing outboard
- 22—Engine nacelle
- 23—Tail boom assembly
- 24—Inner wing flap assembly
- 25—Outer wing flap inboard
- 26—Outer wing flap outboard
- 27—Aileron assembly
- 28—Main landing gear door
- 29—Spoiler inboard
- 30—Spoiler outboard
- 31—Wing tip
- 32—Outer wing main section
- 33—Main landing gear
- 34—Engine mount
- 35—Propeller assembly
- 36—Nose landing gear
- 37—Spinner assembly
- 38—Crew nacelle front entrance door
- 39—Cannon cover
- 40—Inner wing main section
- 41—Flap assembly
- 42—Panel assembly
- 43—Cowl panel
- 44—Cowl access flap
- 45—Outer wing trailing section
- 46—Inner wing—trailing section panel
- 47—Horizontal stabilizer
- 48—Vertical stabilizer
- 49—Rudder assembly
- 50—Rudder tab
- 51—Elevator assembly
- 52—Servo tab
- 53—Elevator trim tab

of the same size and weight. This is made possible by the small amount of wing space occupied by the diminutive conventional type ailerons of the Widow. The hydraulically operated wing flaps are constructed of aluminum alloy and so linked as to move aft and down when extended. Airflow through the flap gap is prevented by a fabric flap-gap seal.

The stabilizer is constructed of aluminum alloy ribs and covering supported by two spanwise spars. It is bolted to the fins at the ends of the spars and faired with light, easily removable fairing strips.

The fins are of all-metal construction similar to that of the stabilizer. The closing channel at the trailing edge forms the main spar. An auxiliary spar is located just after of the fin leading edge and extends from the tip downward approximately six feet. The lower por-

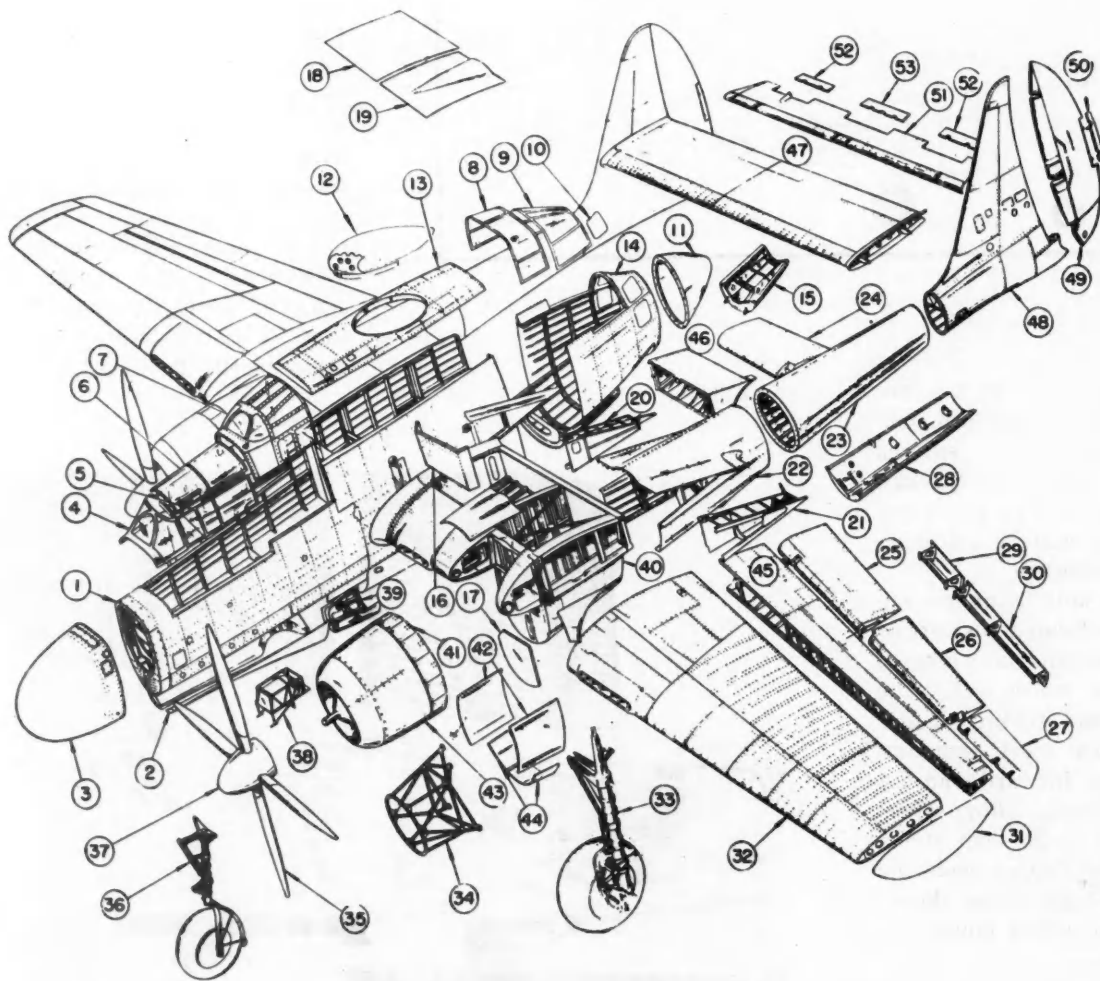
tion of each fin forms the aft end of a tail boom and is attached to the boom by an elliptical internal attaching angle.

The elevator and rudders are constructed of fabric covered aluminum alloy frames. Each is statically and dynamically balanced. All-metal combination trim and booster tabs, controllable from the pilot's cockpit, are built into their trailing edges.

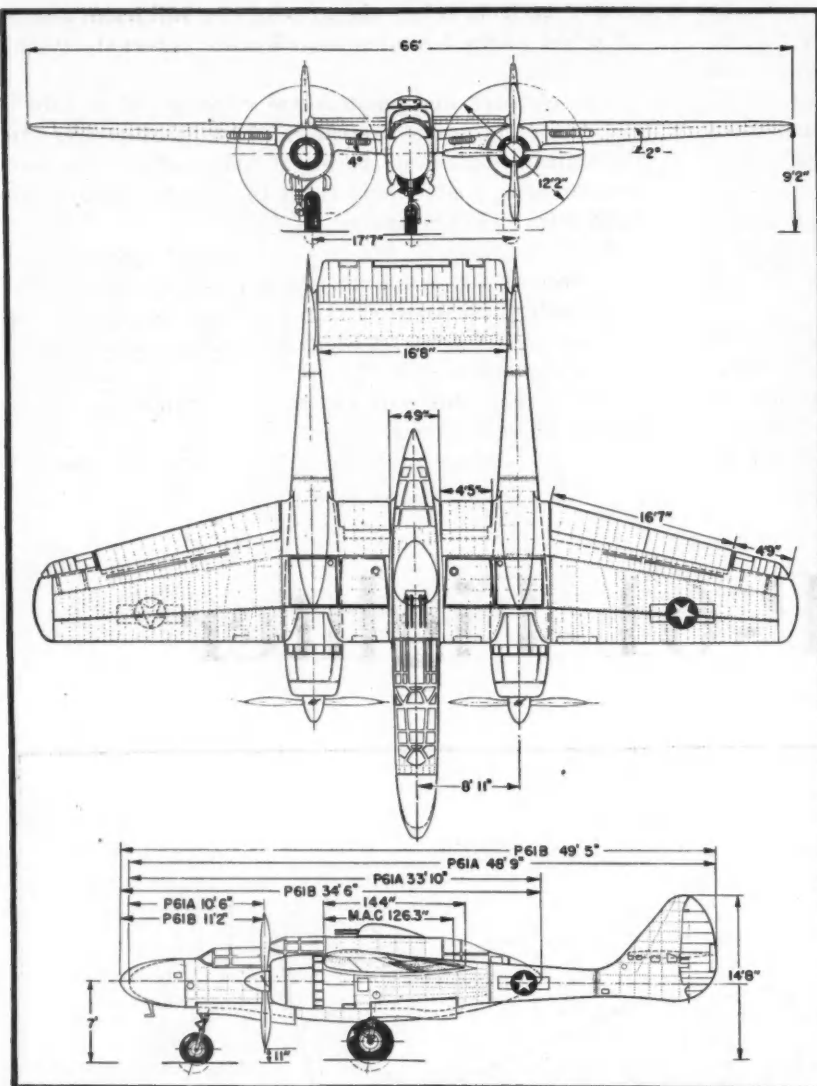
The crew nacelle encloses the pilot's compartment and stations for a gunner and a radio operator. The construction is stressed skin stiffened by transverse channel type frames and longitudinal extruded aluminum alloy bulb angles. The wing front and rear spars extend through the center of the nacelle in front of and behind the gun turret.

The gunner's compartment is immediately behind

f Northrop P-61 Fighter



**Principal dimensions of the
P-61 Black Widow.**



door may be lowered from within or from the ground, by turning the handle on the aft end of the door. The free fall is checked by a hydraulic cylinder and piston dampener. The door is closed manually from outside or inside, and a key lock is provided for ground use.

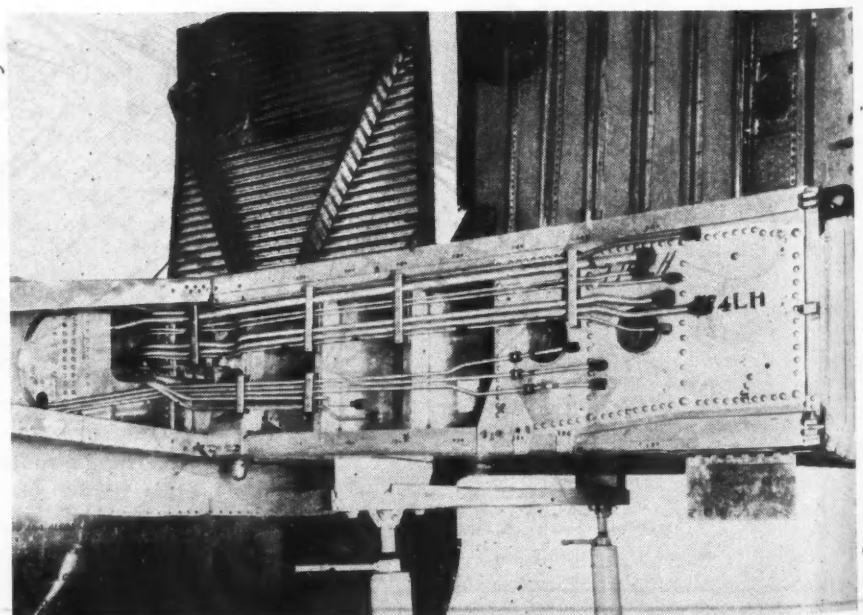
The radio operator's entrance and escape door is located just forward of the tail cone. The door is cable controlled from within, and by a push button from the outside. Another cable removes the hinge pins at the forward end allowing the door to fall free for an emergency exit.

A fully retractable, hydraulically operated tricycle-type landing-gear is installed. Each wheel retracts aft and up, the main wheels into the engine nacelles and the nose wheel into the crew nacelle. Wheel recesses are closed by automatically operated doors when the gear is retracted. A cam arrangement within the nose gear shock absorber strut maintains the wheel in a fore and aft position when the strut is fully extended. A hydraulic shimmy damper is attached to the nose gear shock absorbing strut to prevent rapid oscillations of the nose wheel during ground operations. The nose gear is equipped with an emergency operation air battle located beneath the crew nacelle floor, aft of the nose

the pilot's cockpit. The two are interconnected so that both compartments may be entered through the same door through the nose wheel well or uncovered for emergency exit by releasing the cockpit enclosure.

The pilot's and gunner's entrance door is located just aft of the pilot's seat and is combined with the nose wheel well. The door frame and folding ladder form a welded steel structure hinged at the forward end. A formed aluminum alloy wheel well is riveted to the door structure. Neoprene tubing seals the door weather-tight when closed. With the nose wheel down, the

LH inner wing—inboard rear spar, P-61B.



Some Principal Dimensions of the P-61

WINGS

Airfoil section—root	.....ZAP 15 per cent section
Airfoil section—tip	.....ZAP 13 per cent section
Chord at root	.....144 in.
Chord near tip (31.375 ft from centerline)	.....80 in.
Dihedral (wing reference plane)	
Outer wing	.....2.0 deg.
Inner wing	.....4.0 deg.
Dihedral (top face of front beam)	
Outer wing	.....26.5 min.
Inner wing	.....4.0 deg.

STABILIZER

Span	.....200.0 in.
Maximum chord	.....56.5 in.
Incidence (fixed)	.....0.0 deg.

CREW NACELLE

Width (maximum)	.....49.06 in.
Height (maximum)	.....12 ft 4.0 in.
Length	.....33 ft 10.0 in.

AREAS

	Sq Ft
Wings (total)	.....662.36
Wings (less ailerons)	.....651.36
Ailerons (total)	.....11.00
Spoilers (total—fully raised)	.....11.46
Flaps (total)	.....124.61
Stabilizer (incl. elevator)	.....124.80
Elevator (incl. tabs)	.....45.64
Elevator trim tab	.....2.25
Fins (total)	.....40.10
Rudders (incl. tabs)	.....41.20
Rudder trim tabs (total)	.....2.15

ENGINES

Model	.....R-2800-1
Type	.....Double row, radio, air cooled
Number of cylinders	.....18

wheel well which introduces air into the actuating cylinder to extend the gear in the event of hydraulic system failure.

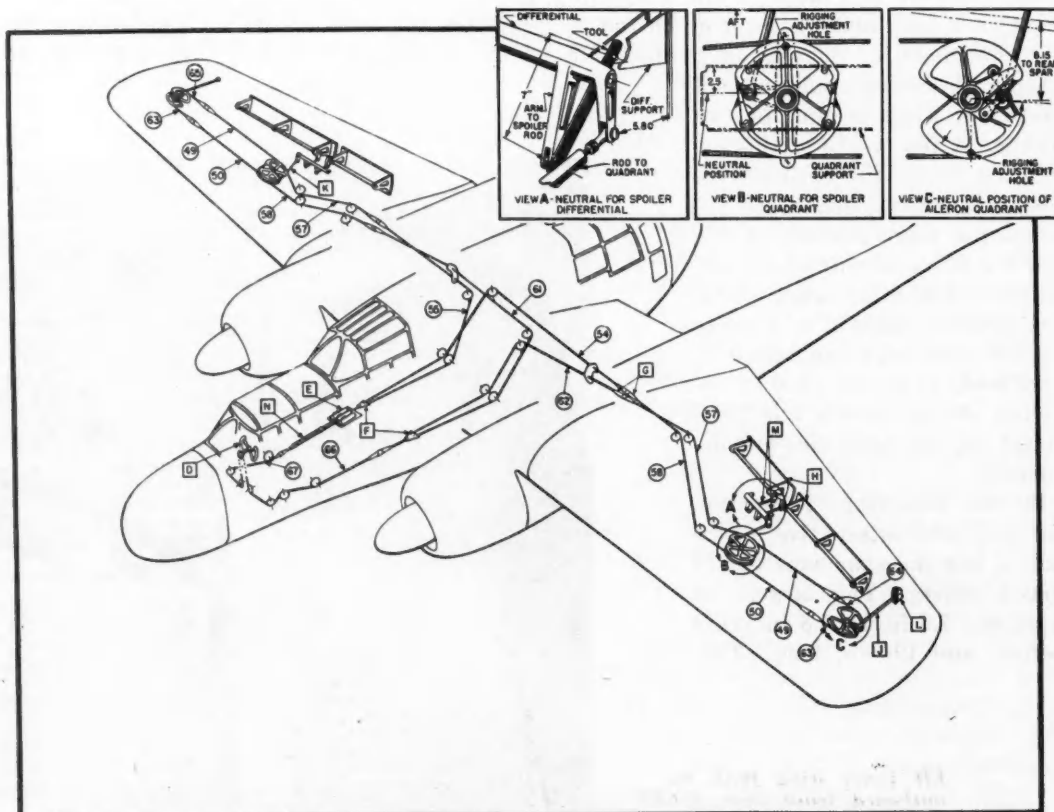
A hydraulic bungee cylinder assists each main gear in completing its extending movement. Hydraulic pressure for the operation of the cylinder is derived from a partially filled bottle the upper portion of which contains compressed air. Thus, in event of hydraulic system failure, the landing gear may be extended by pulling the emergency handle. The main wheels will lower their own weight and the bungee cylinder will force the gear into the locked down position.

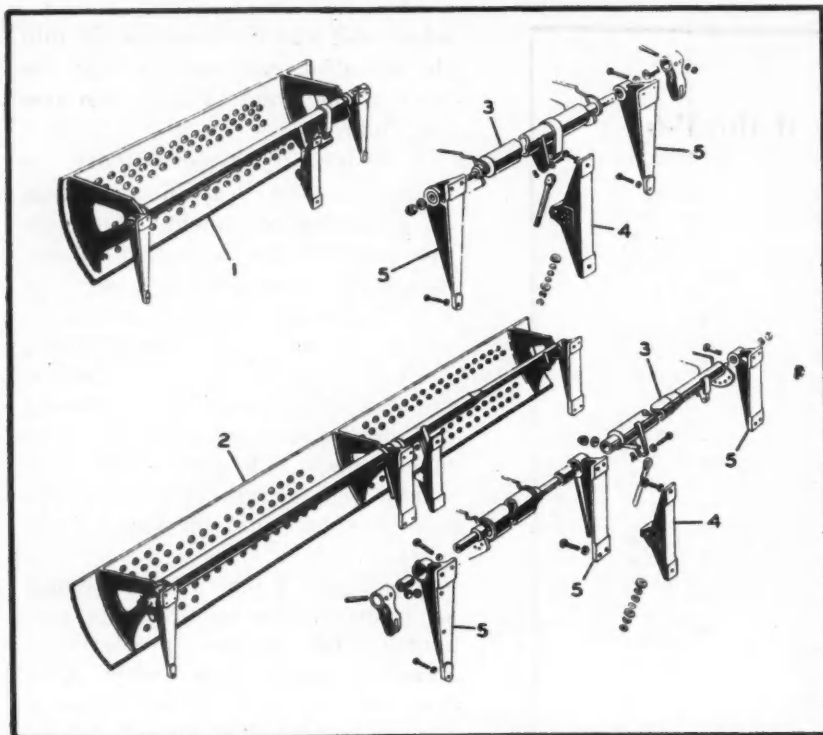
The Black Widow's size, coupled with performance requirements, presented some unusual problems in structure design. The design problems became production problems, some of which will be described here.

The wing is a two-spar structure composed of inner panel, outer panel, and tip. The wing spar caps, because of the high loads imposed, at once became a major problem. Because of the large cross section area required, extrusions could not be used on the early P-61's because no extrusion presses large enough were available. From necessity the spar caps were

Aileron and spoiler control diagram.

- D—Control wheel
- E—Servo unit
- F—Links
- G—Turnbuckles
- H—Spoilers
- J—Aileron push-pull rods
- K—Differential push-pull rods
- L—Aileron horn
- M—Spoiler push-pull rods
- N—Splice assembly





Spoiler assembly.

1. Inboard spoiler
2. Outboard spoiler
3. Torque tube
4. Counterbalance
5. Mounting bracket

billet weighed 610 lb and had to be machined down to 131 lb—a metal removal of 479 lb per cap. The spar mills had to be re-tooled for the billets, and machining started again.

Because of the size of the billets, heat treatment was critical. Surface checks did not truly indicate core hardness and sample coupons had to be cut from each billet prior to machining. Frequent re-heat treatment was necessary. Machining the first billets took approximately 10 hr of spar mill time. This was gradually whittled down to approximately 5.0 hr.

Finally, after a program of trial runs, testing, etc., Bohn Aluminum was able to produce extrusions in

14ST which were suitable for the job. The largest extrusion, having an 8.0 in. maximum cross section, weighing about 37 lb per ft was the largest extrusion produced in the world at that time. Spar caps are being milled in slightly less than one hr floor to floor.

Some interesting facts on high speed milling were discovered during this program. For example, the spar mills were originally purchased with 30 hp horizontal motors. To speed up the hogging time, these were replaced with 60 hp motors, and then again with 100 hp motors. At the present time mills are removing 238 lb

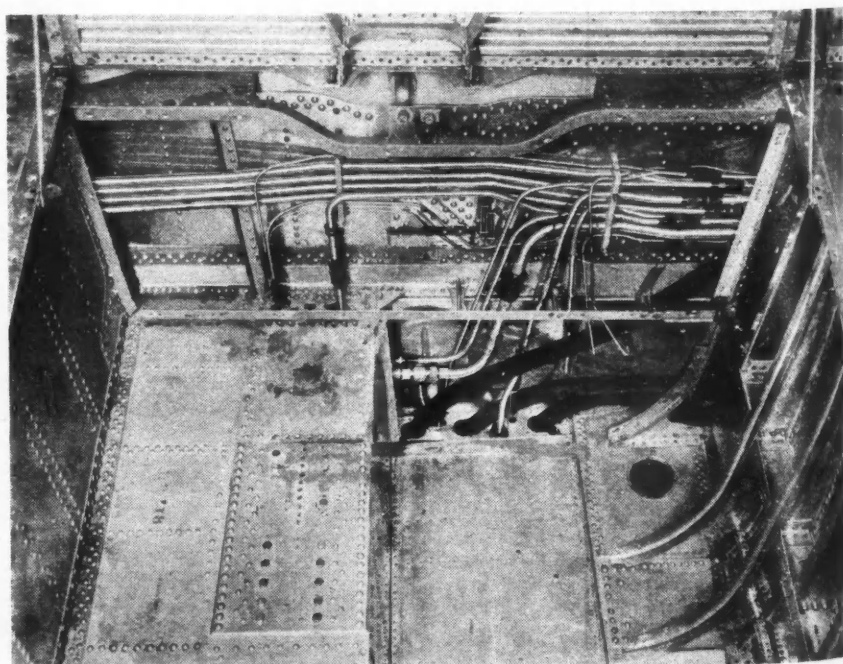
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designed as die forgings.

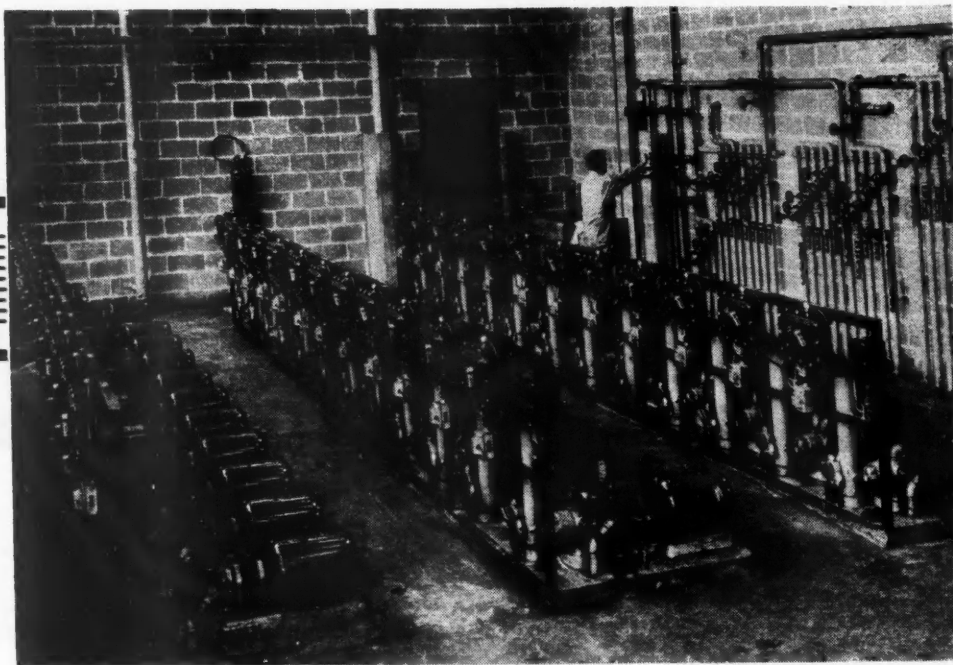
The inner wing front spar upper, which was the largest, became a die forging 115 in. long weighing 255 lb. The finished weight of this particular cap was 131 lb, which meant a metal removal of 124 lb per cap. Special heavy-duty spar mills were obtained for the job.

Difficulties were encountered with the forging dies. As fast as they were completed they would break—sometimes before 20 pieces were run. These dies, which consisted of a blocking and a finishing die, were about 14 ft long and when set up on the forging hammer extended over the edge of the bed. No amount of bracing, it seemed, could prevent fracture in the over-hung part of the die. A few weeks of this experience forced the obvious conclusions that forgings were unobtainable. Coincidentally at this time the Bohn Aluminum Co. announced that their large extrusion presses, capable of producing the size extrusion required, were ready to go into production. Within 48 hr orders had been placed for extrusion dies and extrusions.

In the meantime production had only one alternative which was to hog the spar caps out of forged billets. The largest of these was 7.0 in. by 8.5 in. cross section, and 120 in. long. This



LH inner wing tank bay—outboard front spar, P-61B.



Inside the central oil storage house. View of some 36 Roper pump units used for the transfer of various fluids to the filling station outlets in various parts of the plant.

Centralized System

Facilitates storage and distribution of lubricating oils and cutting fluids

IN RECENT years the general trend has been to the centralization of facilities for the storage, distribution, and reclamation of lubricating oils, cutting fluids, and other materials used in testing and fabricating automotive products. One of the most comprehensive of such installations was made some time ago by the George D. Roper Corp., Rockford, Ill., in a plant responsible for a major part of the output of large air-cooled aircraft engines.

In the accompanying picture is shown the battery of some 36 Roper pumps in the oil storage house of this plant. Here are stored the various oils and liquids—cutting fluids, solvents, hydraulic oils, hot engine oil, and other types required in the operation of the complex manufacturing organization. The function of each of the pumps is to speed a particular type of fluid, served at its station, to the filling station outlets which are found in the engine test cells, assembly floors, and machine shops.

Each pump is individually driven by a 3-hp motor, automatically controlled by pressure switches, and has a rated capacity of 20 gpm. A pressure of 40 pounds is maintained in the pipe lines which extend to three main outlet stations.

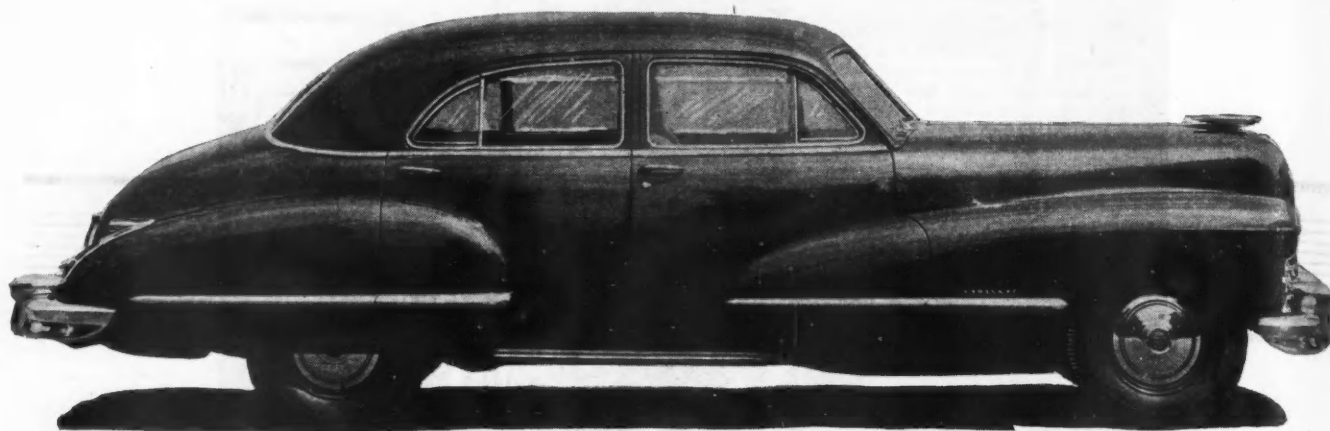
The nearest outlet station is at a distance of 1500 ft, while the most remote station is about 5500 ft distant.

One of the distributing stations is located in the machinery and assembly building. This station is supplied from the main oil house, located about 1500 ft away, by an overhead and underground system of piping. Two different methods are used to transport the fluids—a hand cart for small drums and an industrial truck for handling larger volume and for longer distances within the department.

For handling inflammable liquids such as cleaner's naphtha, there is a single Roper rotary gear pump with a capacity of 105 gpm, driven by a 10-hp motor and serving a large safety tank. This pump delivers naphtha to an outlet station located 5950 ft away, through three-inch piping laid underground.

The oil reclaiming system is served by a single Roper rotary pump transferring the used oil through the various stages of the reclaiming process. The unit has a capacity of 20 gpm, is bed-plate mounted, and driven by a 3-hp motor.

The storage house tanks are filled directly from railroad tank cars carrying the various fluids used in the plant. Transfer from the tank cars to the storage house is effected by one Roper pump unit provided with a relief valve and deep packing box. It is readily accessible for servicing and so arranged that individual parts can be inspected or replaced without disturbing the piping or mountings.



Side view of 1946 Cadillac 62 model.

HAVING built thousands of powerplants for use in military vehicles during the war, Cadillac is in position to offer 1946 models in which the engine and Hydramatic transmission have had the benefit of wartime production and design details consistent with the requirements of heavy-duty service. Starting with the engine, it is the same in specifications and rating, but incorporates many important refinements resulting from military service. The engine is a V-8, of L-head type, $3\frac{1}{2}$ in. bore by $4\frac{1}{2}$ in. stroke, 346 cu in. displacement, rated 150 hp at 3400 rpm. Main and connecting rod bearings are of the Moraine Durex type, steel-backed precision shells, improved in quality during the war. The heavy-duty type aluminum alloy pistons, used in military vehicles, are continued for passenger cars. These are fitted with three rings instead of four which was the former practice. Perfect Circle rings are continued—two type 200 compression rings, $\frac{5}{64}$ in. wide, and one type 85 oil ring, $\frac{3}{16}$ in. wide.

The valve guides are Ferrox treated to resist scuffing and prolong valve guide and stem life. The valve guide counter-bore is $\frac{3}{16}$ in. deeper and $\frac{1}{16}$ in. larger in diameter to improve resistance to valve sticking. The fan and generator belts are made from heat and oil resisting synthetic rubber compounds, having greater durability than the prewar belts.

The carburetor has been improved to prevent sticking when using gasolines with high gum content, the choke mechanism being redesigned to provide con-

sistent operation by chrome-plating the choke shaft and by incorporating narrow shaft support bearings which reduce the tendency to bind with slight gasoline deposit on the shaft. An improved acceleration pump which has more positive action has been developed. This improves the acceleration during all conditions through the assurance of a correct fuel supply. The choke heater stove on the exhaust manifold is a new design.

Throttle controls for the Hydramatic transmission have been redesigned to obtain greater wear resistance and provide accurate and smooth transmission operation. The accelerator pedal and linkage has been changed on all models including the Hydramatic. The clutch hub is Lubrite treated to prevent clutch disk sticking on the transmission input shaft.

Cadillac



Appointments and trim in the rear passenger compartment of the 75 model.

The engine water hoses are made from heat resisting synthetic rubber compounds and incorporate an extra ply of fabric on the outside diameter to prevent hose clamp embedding.

Engine thermo plug is of a new design with special "metallic-glass" developed to replace the copper-oxide element. This construction was used on military equipment and has proven very reliable. The head light foot switch is a die cast housing instead of sheet metal. The generator voltage regulator has been altered to eliminate regulator hum by the addition of a copper sleeve to the magnet core.

New grille of the 1946 Cadillac.
The 62 model is shown here.



C adds Wartime Improvements to Engine and Hydramatic Transmission on 1946 Cars

The shifting mechanism for the standard transmission, located on the lower steering column, contains operating lever keys and shaft key notches of increased hardness. Offered as optional equipment, the Hydramatic transmission represents a modification of the heavy duty unit used in military vehicles.

The prewar flywheel for the Hydramatic had a separate welded-on starter ring gear. The new design has the starter gear teeth cut directly on the outside diameter of the one piece, heat treated, high carbon steel flywheel. This avoids welding distortion and provides a design better suited to precision manufacturing. The flywheel drain plug now is located at the lowest point

on the outside diameter of the flywheel cover, to provide more complete drainage with the oil stream pointing straight down.

The new torsional vibration damper removes torsional vibration from the drive line. Special bronze friction surfaces are employed to provide frictional stability. Leak-proof rivets are used for attachment of the damper plates to the flywheel cover. A stronger Hydramatic case casting with more generous webbing is used to obtain greater rigidity and provide ample protection against excessive loads and rough handling.

A new design front oil pump is employed with internal-external type gears surrounding the hub of the front unit drive gear, thereby eliminating the front "cross drive" gears. The improved tooth action plus the smoother oil flow characteristics of the helical gears provide a quieter pumping action. A simple "blow off" type pressure regulator is used. The lubrication oil passages have been simplified in conducting the oil first into the fluid flywheel and then out through the pressure relief valve to the lubrication system.

Fluid circulation has been modified to reduce torus thrust on the transmission shaft by adding three $\frac{1}{4}$ in. diameter holes to each of the torus hubs. These holes serve to balance the oil pressure on opposite sides of the torus. The size of thrust washers has been increased, thereby increasing their load capacity 50 per cent. Washer friction and wear has been further reduced by use of fewer washers (three in place of five).

A new Hydramatic fluid (Spec. No. WA 389) improves performance under low temperature conditions, due to change in low temperature viscosity characteristics. It reduces starting drag and promotes quick warm-up to normal operating conditions. Detergent and new inhibitor agents have been added to reduce the formation of gum and sludge. An anti-foam additive also is incorporated.

The oil pan and screen have been redesigned to prevent introduction of air into the rear pump inlet and hence cause loss of fluid pressure. The inlet is located lower and further forward. The amount of fluid reaching the external seal has been reduced by use of two piston ring seals (in place of one). To remove excess fluid from the neighborhood of the seal, a larger drain passage is provided for the air chamber adjacent to it. The transmission drain plug has been relocated to the extreme rear end of the oil pan.

An annular-type clutch piston— $5\frac{1}{8}$ in. outside diam, 3 in. inside diam—is used in place of the six $1\frac{5}{8}$ in. diam pistons formerly in each unit (front and rear).

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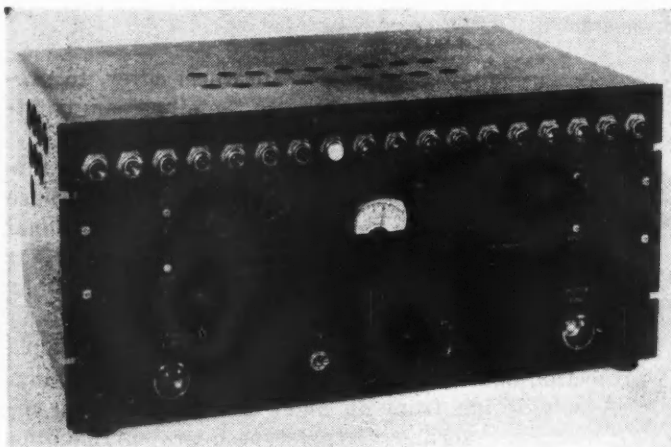


Fig. 1. Failure sequence indicator

THE usual aircraft structure is quite complex so that many of the data for stress analysis must come from empirical tests; and after an analysis has been made it is usually checked by additional tests. For many years the aircraft industry has used strain gages of various types to obtain many of these facts. However, strain gages are useful for measuring relatively small strains over a limited area only, and since the strain distribution in the structure under test is usually the least known factor, it is difficult to be sure that at least one of the strain gages is measuring the highest localized strain. Even if a strain gage is in the proper location and properly oriented it may not give a good indication for extremely localized strain, since a strain gage will average the strain over its active area. Of course, failure, when it occurs, is usually recognizable. However, even after failure, the location of initial failure is not definitely established because an initial failure of a weak section will usually cause progressive failure in adjacent stronger sections due to the resultant redistribution of the applied load.

In compression tests the failure is usually in buckling and in many cases it occurs slowly enough and with enough warning to be easily observed. However, in tension tests in which fracture or actual separation occurs, the failure often gives no warning and can progress, perhaps, at the speed of sound in the material. For example, in a specimen of 24ST dural, three ft wide, a failure initiated at one side may be complete in as little as 500 microseconds. It is highly desirable to locate the origin of such failures exactly.

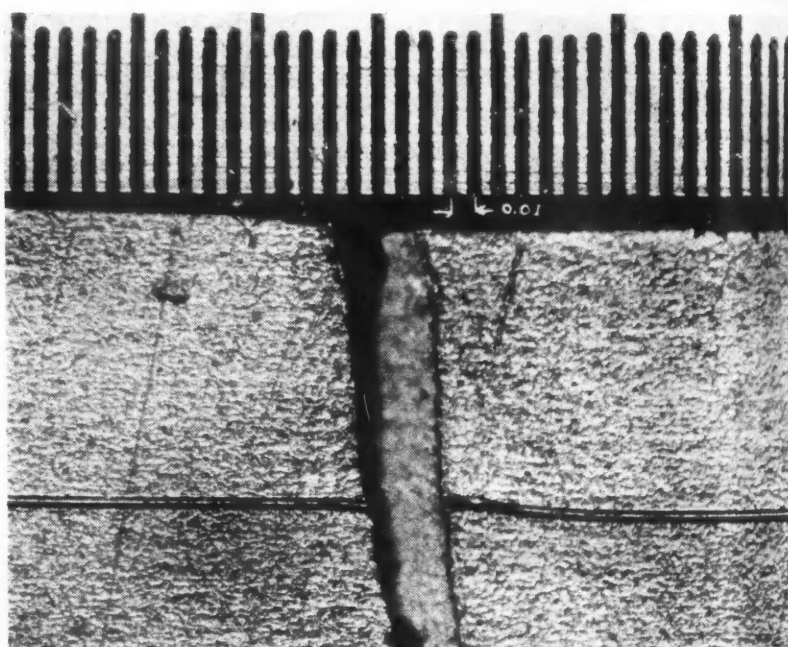


Fig. 2. Typical failure of failure sequence wire when cemented to 24S-T86

Ordinary techniques of obtaining data of this nature with the use of high speed cameras or dynamic strain equipment are not very satisfactory because the interval in which the failure can occur may be from several minutes to several hours and real difficulties involving film speed and length of film are encountered.

An ideal instrument for this type of measurement should start to record at the instant of initial failure (or slightly before), should be reasonably portable, should be simple to operate and install, and should have no effect on the strength of the structure. The device described here (Fig. 1) incorporates most of these features.

The pickup or activating elements of the instrument are composed of small copper wires which are cemented to the surface of the structure. It has been determined experimentally that such wires, when cemented to aluminum alloy, will fail in tension at

Initial Failure Test Specimens

By **Richard W. Powell**

Research Engineer
Lockheed Aircraft Corp.

almost the same time as the structure (Fig. 2). This is true even if the wire is more ductile than the structure, because at failure the wire is constrained by the cement bond at both sides of the rupture and consequently the strain in the wire is highly localized. The wire must be small in diameter so that the cement bond will be strong

in comparison to the wire. It must be large enough and of proper material so that its incremental elongation will exceed that of the structure. No. 40 annealed copper wire is suitable for incremental elonga-

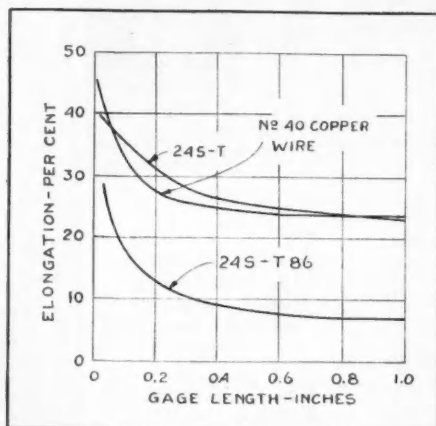


Fig. 3. Per cent elongation of No. 40 annealed copper wire compared with per cent elongation of 24S-T and 24S-T86

tions up to about 50 per cent. (Fig. 3). In practice No. 40 Formex insulated wires are cemented to the structure with Goodyear MN28C cement and spaced usually not closer than four in.

There are several possible standard methods of recording sequence of failure of the wires, but for the most part they are not suitable because of the indeterminate time of failure or because of the short time involved during failure. The following method, however, has proven practicable. Consider first several condensers which are connected in series with a battery and resistance. The sum of the voltages on the condensers is equal to the battery voltage at any time after closure that is considerably greater than the time constant of the circuit. The voltage across each individual condenser is determined by its capacity, leakage, and initial state of charge. If each condenser is short circuited by a failure sequence wire, the

charge on each condenser is zero until the first wire fails. If the condensers are of equal capacity, the charge of any one is always greater than that on condensers starting to charge at a later time, and always less than that on condensers that started to charge at an earlier time. If the leakage is small, the charge on each condenser may be measured after failure by a ballistic galvanometer or a vacuum tube voltmeter, and the sequence of, and interval between the failure zones determined.

Unfortunately, it is very difficult to keep these leakages small if the condensers remain attached to the specimen and to the battery. Therefore, 10 milliseconds after the failure is complete, all circuits to the condensers are opened automatically, so that the slight remaining leakage will merely decrease the

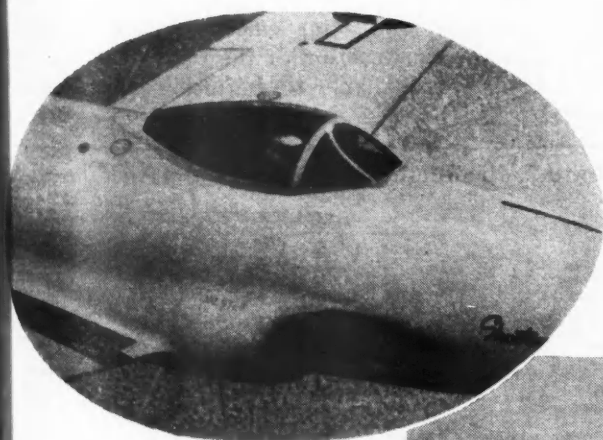
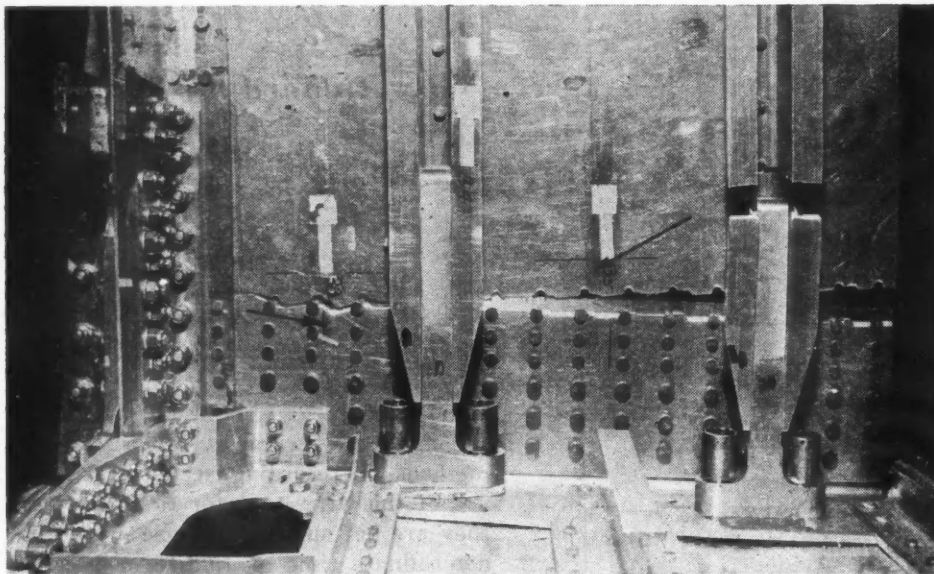


Fig. 4. Model P-80 canopy failure after pressure test employing 15 strain gages and 12 failure sequence wires. Arrows indicate visible wires. Insert shows general construction of canopy assembled to airplane.





charge, leaving the ratios of charge between the several condensers relatively unchanged. The condensers are carefully picked for low dielectric leakage and for uniformity of capacity.

Even with the preceding precautions the time of manually recording data for a large number of sequence wires could allow excessive leakage. The instrument is therefore provided with an automatic stepping relay that scans the condensers and indicates first failure with a numbered light. Immediately following failure, the scanning relay automatically goes into operation connecting a vacuum tube voltmeter, which does not discharge the condenser, to each condenser successively. If any condenser has a voltage of 80 per cent or more of the applied voltage, a relay is actuated, the scanning is stopped, and the corresponding light indicates the location of the first failure. In case of initial closely successive wire failures the switch will scan through once and the operator may increase the voltmeter sensitivity until a stoppage of the scanning relay is effected. The number of the wire is indicated as before by the lights, and the voltage on the condenser is indicated by the meter on the front panel. When these data have been recorded, the operator may continue the scanning to another stoppage by pressing the "stop" switch to restart and by adjusting the sensitivity control. From these data the sequence of regional failure may be determined and the time between successive wire failures calculated, thereby establishing the direction and rate of propagation of the fracture.

As the instrument is currently used, any number of failure sequence wires up to 18 may be attached (if necessary, it may be designed for any number of wires). It has an initial time constant of 500 microseconds, which means that a difference in time of failure of 20 microseconds of the first two wires may be detected or that the second wire to fail may be determined if it occurs as much as two milliseconds after the initial failure. This time range may be changed to other values by changing the size of the resistor or the condensers.

Fig. 5. (Above)
Detail of Model 49
wing joint failure.
Arrows indicate
visible wires.

Fig. 6 (Right)
Tension test of
Model 49 wing
joint employing
47 resistance
strain gages and
eight failure
sequence wires.



The device has been used on static tests of aircraft structures involving 24S-T, 24S-T86, and Plexiglas structures and in each instance the data obtained were wholly consistent and apparently valid. In several cases structural re-design was based, in part, on the indications obtained by this method, and improved strength and joint efficiency were obtained. Details of the construction of the instrument used in these tests are available to engineers interested in them.

Monthly Production of Trucks and Truck Tractors

1945	LIGHT Under 9,000 lbs. G.V.W.			MEDIUM 9,000—16,000 lbs. G.V.W.		
	Civilian	Military	Total	Civilian	Military	Total
January.....	150	21,621	21,621	11,183	3,527	14,710
February.....	1,784	20,641	20,800	10,534	3,376	13,912
March.....	4,746	21,925	23,709	12,829	3,994	16,823
April.....	5,668	18,352	23,098	10,275	3,645	13,920
May.....	5,522	18,633	24,321	12,003	3,526	15,529
June.....		16,306	21,828	12,017	2,093	14,110
Total—6 Months..	17,899	117,478	135,377	68,841	20,163	89,004
July.....	3,993	10,693	14,686	12,558	1,465	14,023
August.....	5,263	4,403	9,666	16,851	2,424	19,275
Total—8 Months..	27,175	132,574	159,749	98,250	24,052	122,302
1945	HEAVY 16,000 lb. G.V.W. and Over			TOTAL—ALL WEIGHTS		
	Civilian	Military	Total	Civilian	Military	Total
January.....	3,836	26,898	30,734	15,019	52,046	67,065
February.....	3,339	26,162	29,501	14,032	50,181	64,213
March.....	3,726	30,474	34,200	18,339	56,393	74,732
April.....	3,959	26,302	30,261	18,980	48,299	67,279
May.....	4,624	26,484	31,108	22,315	48,643	70,958
June.....	5,592	24,815	30,407	23,131	43,214	66,345
Total—6 Months..	25,076	161,135	186,211	111,816	298,776	410,592
July.....	4,843	21,011	25,854	21,394	33,169	54,563
August.....	5,398	10,420	15,818	27,532	17,247	44,779
Total—8 Months..	35,317	192,566	227,883	160,742	349,192	509,934

Douglas DC-8 Airliner

MAJOR SPECIFICATIONS OF DC-8 (MODEL 1004)

WEIGHTS:

Maximum Takeoff Weight.....	39,500 lb
Maximum Landing Weight.....	39,500 lb
Weight Empty.....	23,915 lb
Useful Load.....	15,585 lb
Useful Load/Gross Weight.....	39.4%

PERFORMANCE:

Max. Cruise Speed—10,000 ft.....	270 mph
Max. Two-Engine Climb—S.L.....	1030 fpm
—10,000 ft.....	840 fpm
Max. One-Engine Climb—S.L.....	285 fpm
—10,000 ft.....	145 fpm
C.A.R. Field Length, S.L.—Takeoff...	3950 ft
—Landing...	3960 ft
C.A.R. One-Engine Operating Altitude	12,000 ft

ECONOMY:

Payload at 300 mi. Range.....	12,000 lb
Including:	
Passengers.....	48 max.

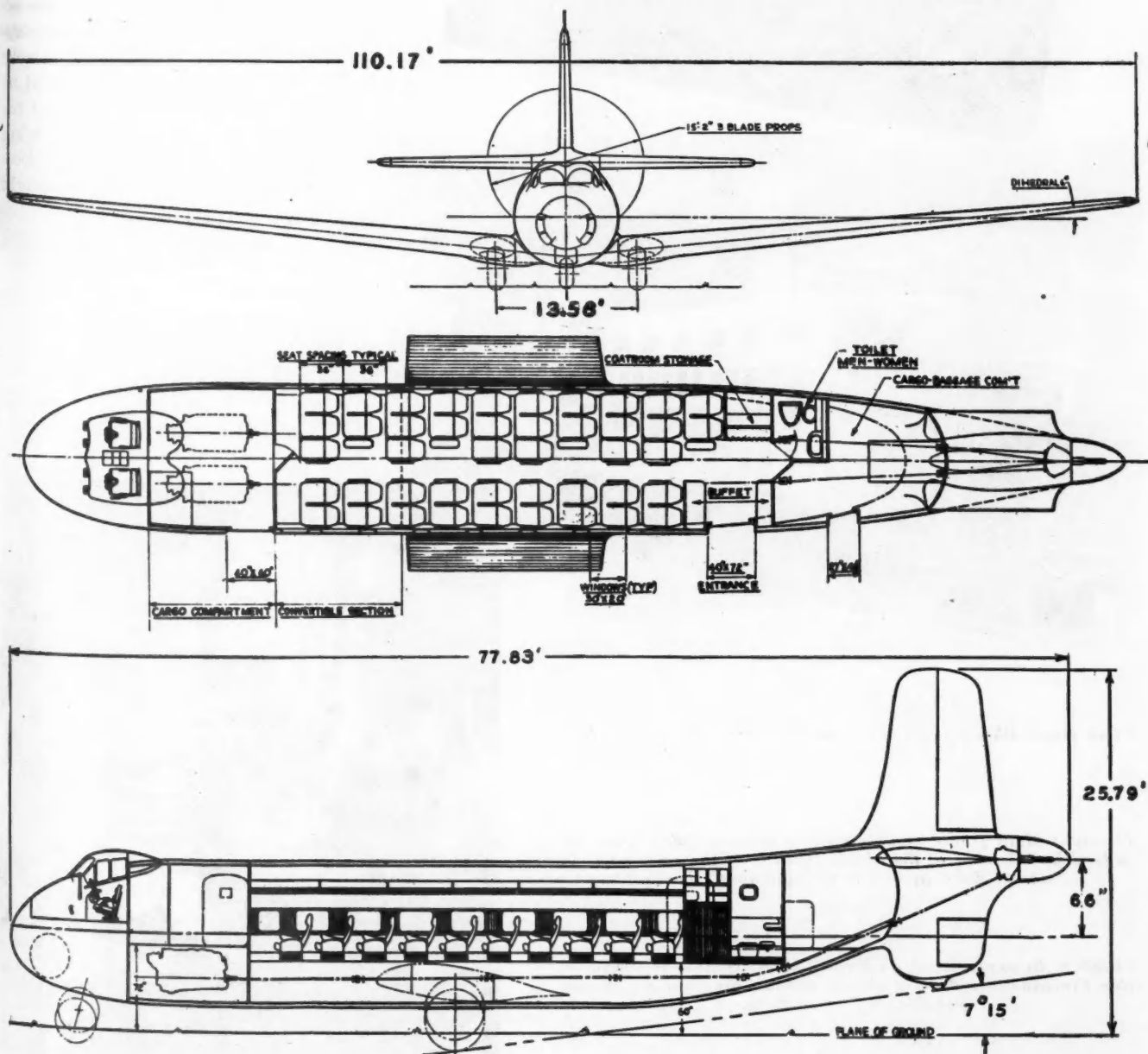
Economy—Continued

Cargo in excess of baggage (at not more than 10 lb/cu.ft.).....	2,400 lb
Block-Block Speed at 300 mi. Range (against 10 mph headwind).....	223 mph
Direct Operating Cost/Plane Mile.....	41.6¢
Direct Operating Cost/200 lb. Mile....	0.695¢

ENGINES:

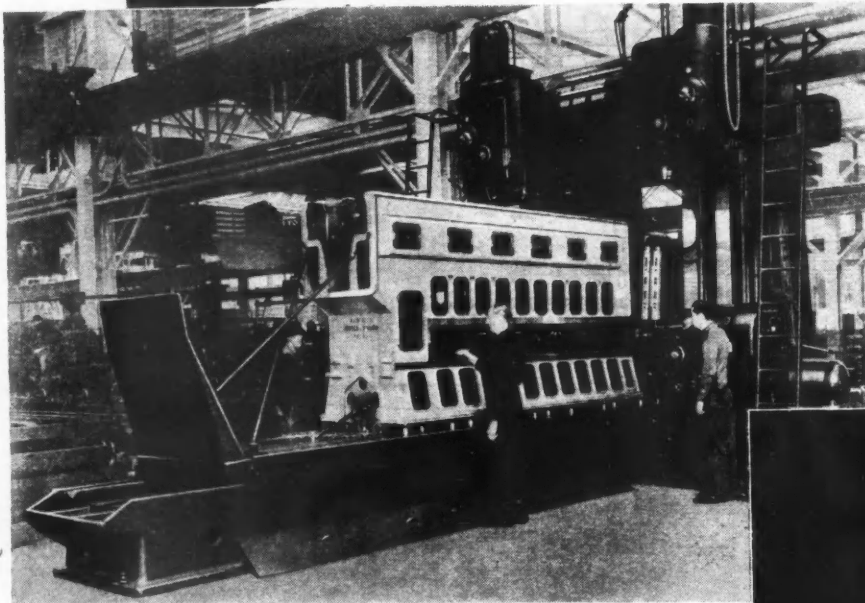
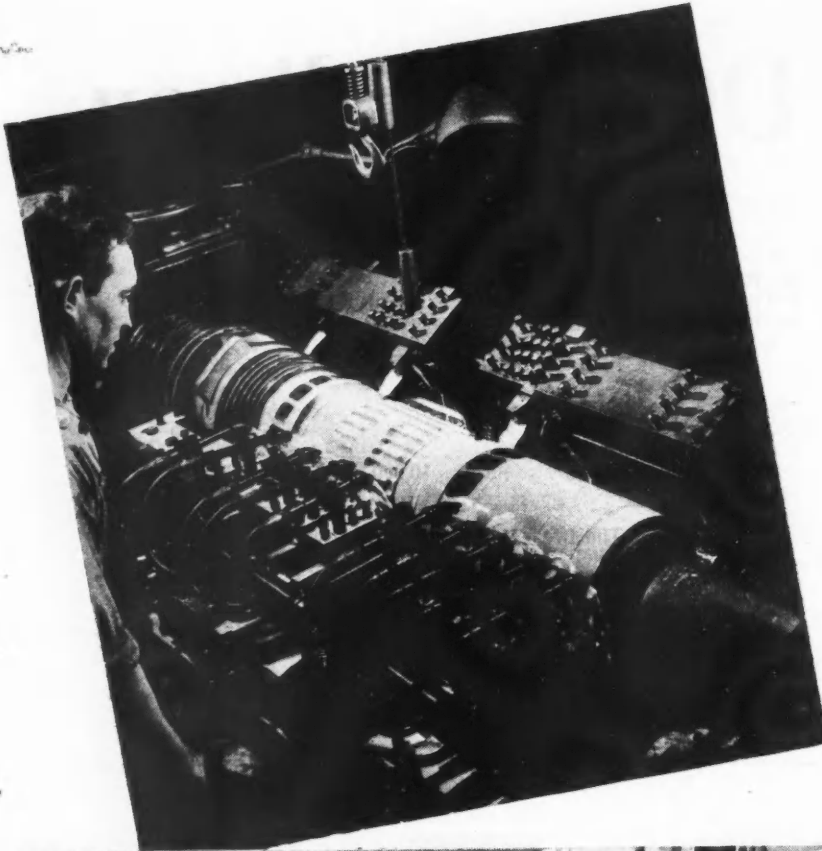
Allison V-1710	
Takeoff Power.....	1600 hp
Rated Power.....	1200 hp
Max. Cruise Power—10,000 ft.....	1025 hp

The two V-1710 engines are located just back of the pilots' compartment and are connected with the counter-rotating propellers at the tail by two sectional shafts extending 60 ft. The shafts are in several sections, supported at each junction by ball bearings, and a bevel gear box about 20 ft from the propellers directs the shafts upward to them.



Diesel E

By Joseph Geschelin



(Top page) Closeup of tooling on Fay automatic for machining the cylinder liner.

(Center) Main frame machining is a sizeable job as may be judged by this view of the block. Milling of the pads on each side is done in this huge Cincinnati Hypro.

(Right) An example of modernity of equipment is found in this Cincinnati Hydro-Tel shown milling the contour of one of the engine sections.



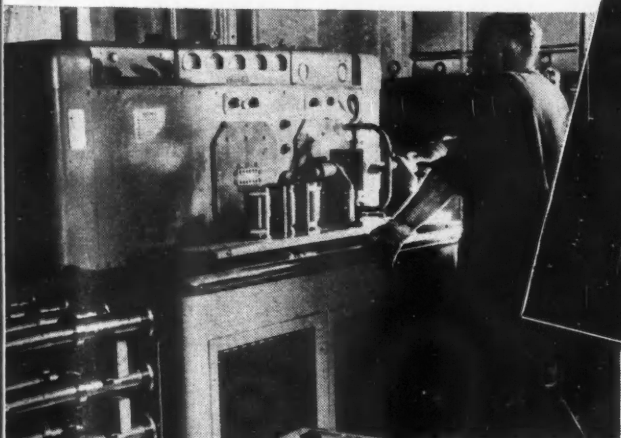
Engine Building

Activities at Fairbanks-Morse Plants

Philip Ruskin, AUTOMOTIVE AND AVIATION INDUSTRIES, June 15, 1945. This article marked the first public disclosure of engineering design made possible by the lifting of Navy security restrictions.

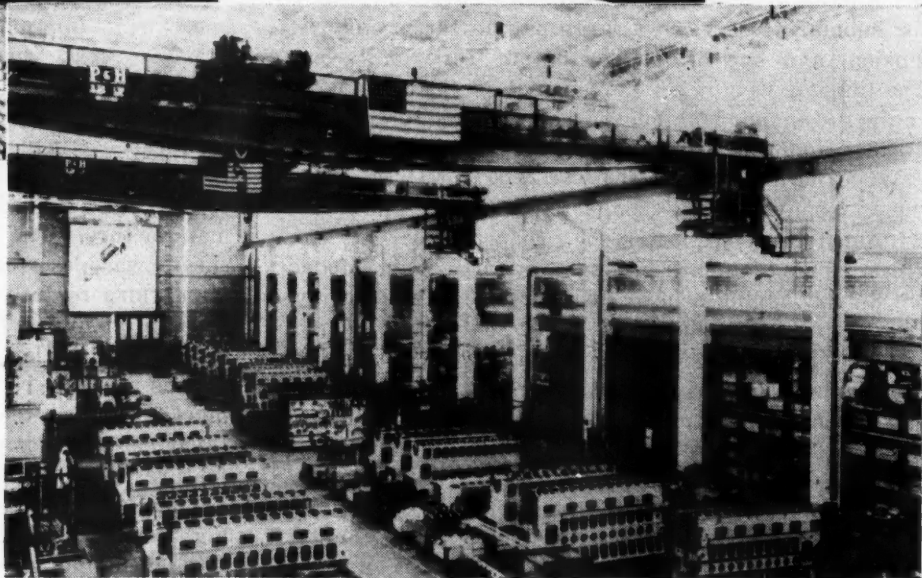
Fairbanks-Morse, a name well-known to our readers, had its beginning more than 100 years ago. Today the company manufactures a wide variety of products for the farm and for industry, including several lines of Diesel engines, electric motors for machine tools and industrial drives, and a line of magnetos for automotive applications. Some idea of the extent of the magneto business may be gained from the fact that over 350,000 units were delivered to engine build-

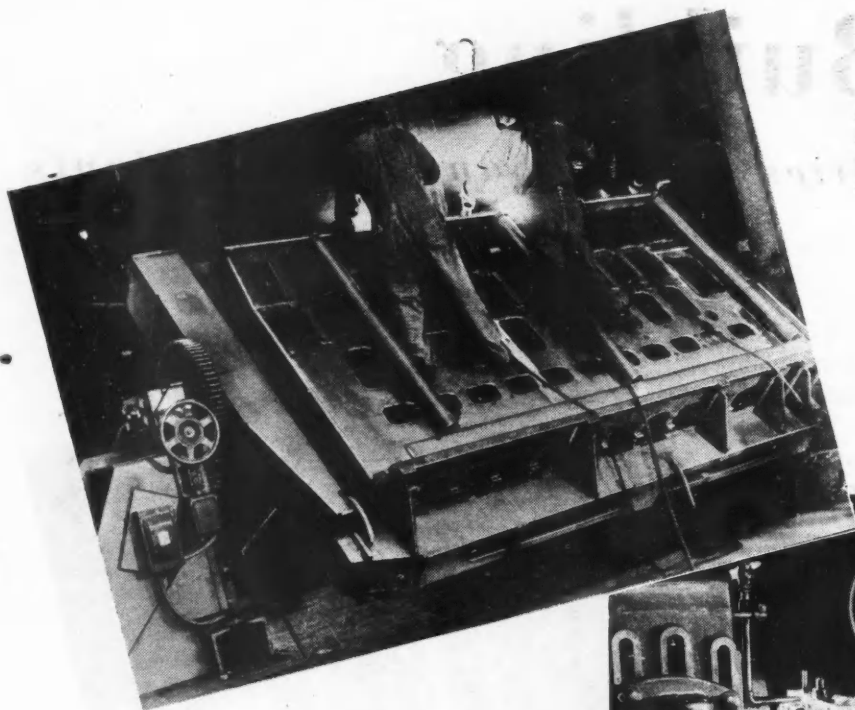
(Right) Following the pressing-on of the cylinder liner jacket, the bore of the liner is honed to size on this big Barnes-drill honing machine fitted with Micro-matic tools.



(Above) Another touch of modernity is imparted by this Tocco, Jr., induction hardening machine. It is tooled to handle the hardening of piston pins and camshafts.

(Right) General view of O-P Diesel erecting floor showing the scope of facilities required for the assembly of large engines.





(Left) Upon completion of the preliminary welding of the block, the assembly is fitted into the large welding positioner, shown here. This is the final welding stage. The operators follow a rigid procedure using the ac arc method and special coated electrodes.

(Below) Sides of the large connecting rods are milled in one setting in this duplex Kearney & Trecker milling machine.



ers in the past year.

Engine building activity goes back to 1893 when the company first entered the internal combustion field with a line of gasoline engines made under the Charter patents. In 1913 the company embarked on a line of Diesel engines of the two-stroke heavy oil engine design. This work and its consequent development proceeded uninterruptedly over the years, culminating in the current manufacture of an impressive variety of Diesel engines of two- and four-stroke types for stationary and marine applications, ranging from five hp to 2000 hp.

Inception of the O-P line of modern light-weight Diesels is said to stem from a request made in 1932 by the Bureau of Engineering of the U. S. Navy (now the Bureau of Ships) to develop two sizes of engines for submarine service—a large engine for main propulsion, and one of smaller output for auxiliaries. The limit of weight per horsepower specified for both engines demanded unique design features as well as unusual manufacturing procedures.

With the incidence of the war program about 1941, the company built a completely modern and self-contained Navy plant for the production of O-P engines. This plant has produced two lines—the Model 38D8-8-1/8, having a basic cylinder of 8 1/8 in. bore by 10 in. stroke, in a range of 5, 6, 8, 9, and 10 cylinders; and the model 38E5 1/4—having a basic cylinder of 5 1/4 in. bore by 7 1/4 in. stroke, in a range of three and seven cylinders. The O-P line has a weight to power ratio of about 17 to 25 lb, including all auxiliary equipment except the main generator.

The new facilities include the main plant in Beloit, Wis., a parts producing plant in Freeport, Ill., and a third plant in Three Rivers, Mich.

From the standpoint of design and production practice perhaps the most noteworthy elements of the O-P engine are the main frame or cylinder block and the crankshaft. The main frame—to be described later—is made entirely of steel, torch-cut to form and size, the assembly being made up by welding. In this respect the main frame is distinguished from the former practice of cast iron construction or of composite steel sections welded to steel forgings or castings. The crankshaft, of which two are used per engine, is a Proferall casting supplied by Campbell, Wyant, Cannon Foundries. It is cored for weight saving and represents the most modern conception of cast crankshaft manufacture. The method of producing these crankshafts was described in *AUTOMOTIVE AND AVIATION INDUSTRIES* recently. This type of crankshaft is said to offer many advantages from a production standpoint. Not the least of these is free machinability as well as a goodly reduction in the amount of metal removal owing to the ability of holding the casting to fairly close dimensional tolerances in the rough. These features serve to reduce machining time considerably.

The Beloit plant is a large modern structure with high ceilings, affording the maximum of worker comfort, including excellent lighting facilities. One of

The parting face of the big end of the connecting rod is finish ground in this Thompson surface grinder. The fixture holds four rods at a time.



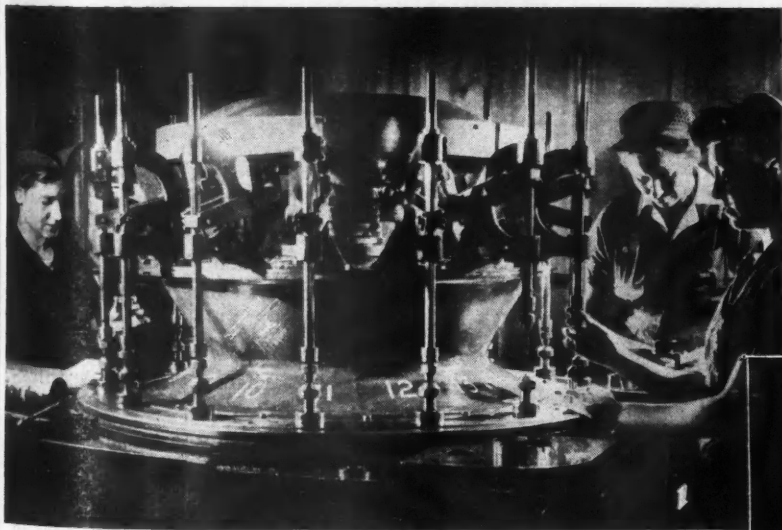
the largest areas of the plant houses the weldery in which are fabricated the main frame, its sub-assemblies, the oilpan, and other parts. Another large area is devoted to special equipment for the machining of crankshafts. Other departments handle the machining of pistons, cylinder liners, blower parts, etc. Although the elements of these engines are so much larger than those used in normal automotive practice, it is of interest to note that automotive production practice has been followed in the selection of equipment and in the general sequence of operations. Many of the machine tools—in makes and types—familiar in automotive plants are found here on similar operations, the difference being in the size of the equipment.

Thus we find large American lathes working on crankshafts, enormous Barnesdrill honing machines, Jones & Lamson turret lathes, Fay automatic lathes, Moline boring mills of various types, Cincinnati and Norton grinders, Cincinnati milling machines, Monarch engine lathes, Potter & Johnston turret lathes, Warner & Swasey turret lathes, Natco multiple spindle drills, Heald internal grinders, and other familiar makes and types of machines.

Most of the parts going into these engines are produced by the company—the engine frames, connecting

rods, crankshafts, blower, pistons, cylinder liners, etc. In addition, the company has a modern department for the production of the fuel injection system including all of its components. In this respect Fairbanks-Morse not only is as self-sufficient as any producer of engines in the automotive field, but possibly to a greater extent than many.

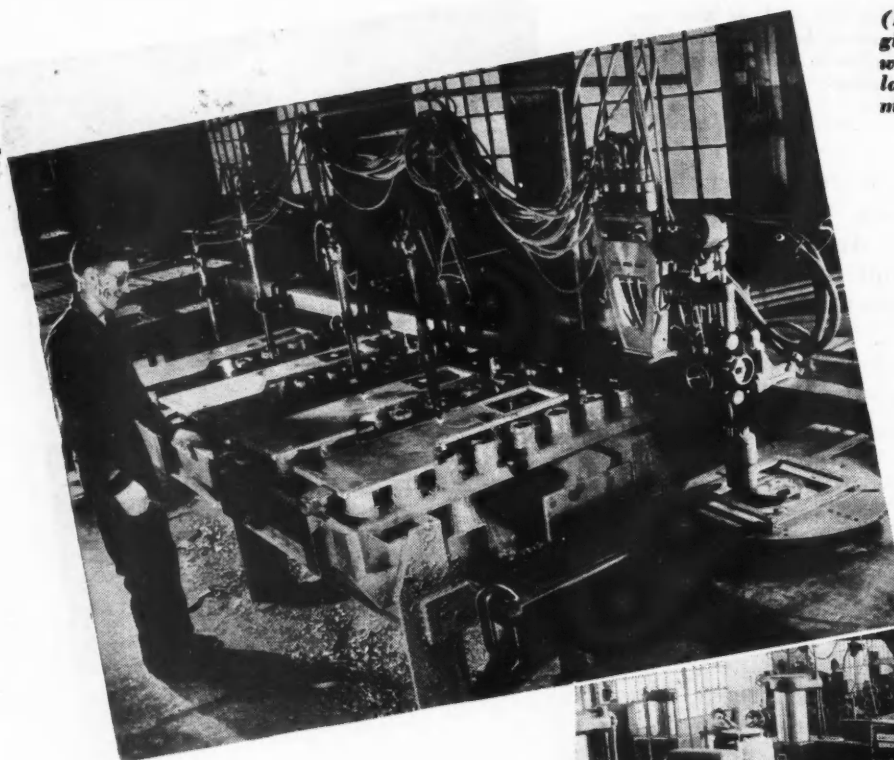
Owing to the mass of detail involved in the machining and assembly of the engine elements, this article will be confined to a few of the details and will devote most of the discussion to the fabrication of the main frame. However, the pictorial section has been so selected as to give the reader a good visual impression of the type and size of equipment used



(Above) The fuel injection department boasts this unusual multiple-spindle automatic machine for lapping plungers and barrels.

(Right) Close-up of one of the master framing fixtures in which the various sections of the main frame are assembled for the initial "tack" and "root" welding. Note the spacer bars, mentioned in the text, for maintaining the proper alignment of bulkheads.



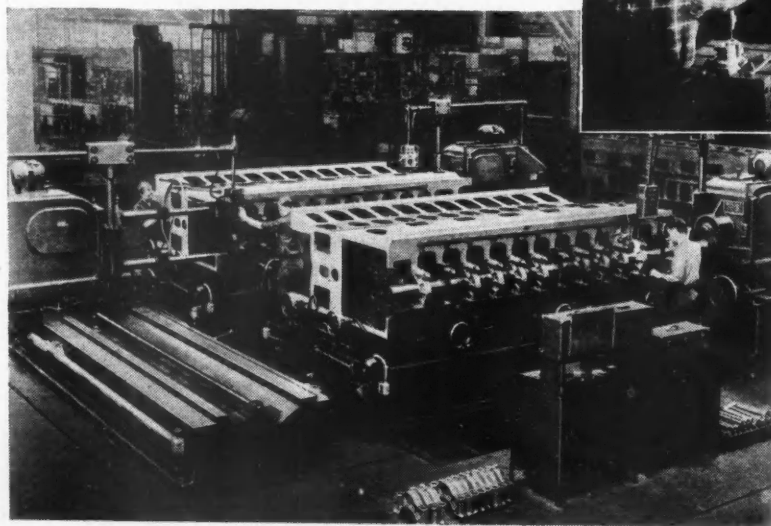


(Left) Fabrication of the main frame begins in the flame cutting section of the weldery. Here may be seen one of the large multiple-torch Airco flame cutting machines which can handle four of the largest sections at a time.

(Below) Here is one bay of the Freeport parts plant to give some impression of the size of this division. In the foreground, at the left, is part of a large battery of American Hole Wizard radial drills. Farther along in the background is a large Natco multiple-spindle drill press.



(Below) Another example of the large scale machine tools required for the block and other parts of the OP engine is this battery of horizontal Moline boring mills used for line boring the camshaft and crankshaft bearing lines.



for performing a sampling of important machining operations.

The development of the fabrication of the main frame may well be considered as a basic part of the course of development of the O-P engine itself. In its early stages the engine featured "wet-type" construction which was subject to water and oil leaks either in manufacturing or in the field. From this emerged the present "dry-type" construction in which the water cooling system is a part of the removable liners while the lubrication system is carried in sepa-

rate oil tubes. The original main frame was assembled from some 1440 separate pieces of cast steel and rolled steel plate members. The present main frame, on the other hand, has been progressively refined to the point where it incorporates only about 400 pieces of bar stock and rolled steel plate sections varying in thickness from 3/16 to 2 7/8 in.

A large but light weight structure such as the main frame is an elastic member subject to considerable distortion during fabrication and welding unless the job is done on a scientifically controlled basis stemming from extensive research. The original design of block with its multiplicity of individual members had a shrinkage of about 1/8 in. per foot; the current block shrinks only 0.039 in. per foot. This shrinkage during fabrication poses a major problem since the structure demands a close control of tolerances for machine shop operations.

To predominate the shrinkage of the present welding block it was found necessary to build full-sized unit sections and to study their behavior under stress. To



Special duty trucks gather steel samples for the laboratory.



A truck is unloaded at the laboratory, and immediately starts another round trip.



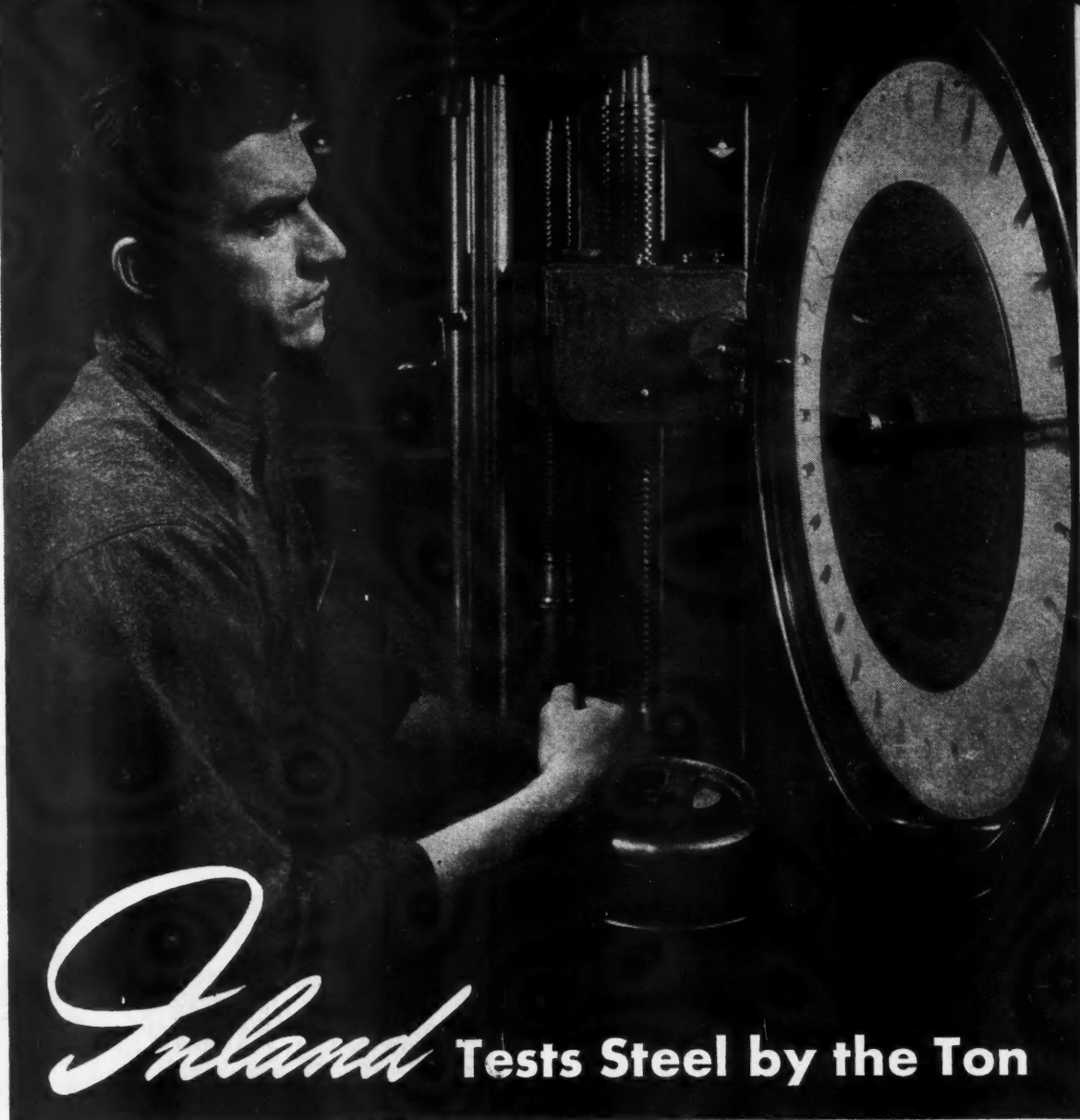
Plate samples are punched to rough form, then milled. Others are sawed, turned, drilled, etc., as required.



Many samples undergo rigid chemical tests.



Metallurgical tests are extremely important for quality control.



Inland Tests Steel by the Ton

Operator determining physical properties on one of the many tensile testing machines in the Inland laboratory.

Darting from mill building to mill building—many times a day, and at night—are Inland trucks on special duty, a duty of vital interest to every user of Inland steel.

They are the sample trucks which rush samples of Inland products to the main laboratory where all required tests must be completed, reported and checked against specifications before steel is shipped.

Samples are gathered for the laboratory at semi-finishing mills—pieces from billets, slabs, etc., that will be

tested before the steel is rolled into final form. Also collected are samples of finished products. Depending upon requirements, every piece of steel delivered to the Inland laboratory undergoes rigid physical, chemical, and metallurgical tests. Many of these tests are special developments by Inland—tests that are fast and extremely accurate.

Yes, Inland daily tests tons and tons of steel to assure every customer that his order will measure up to every requirement.



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this end, the sections were tested to destruction in a 500,000 lb tension testing machine. During the process the specimens were coated with the Magnaflux "stress-coat" lacquer to indicate concentrations of stress, and the stress at various points checked with strain gages.

Coming to the details of frame fabrication, we find that the process starts in the flame cutting bay in which the various members and pieces are flame cut to proper form and size. For this purpose there is a battery of large Airco automatic flame cutting machines, each of which is large enough to cut four main frames or bulkheads at one time. After flame cutting, the slag is removed from the edges of the cut and each piece subjected to a Magnaflux and chip inspection to assure freedom from laminations. This method of quality control is said to be relatively new, having been developed by the company to provide a positive means of differentiating between objectionable and permissible laminations and segregations.

The many bulkheads, detail parts, and major elements such as the heavy bearing saddles thus are flame-cut and prepared for assembly. Following this, minor sub-assemblies are welded up while held in welding positioners.

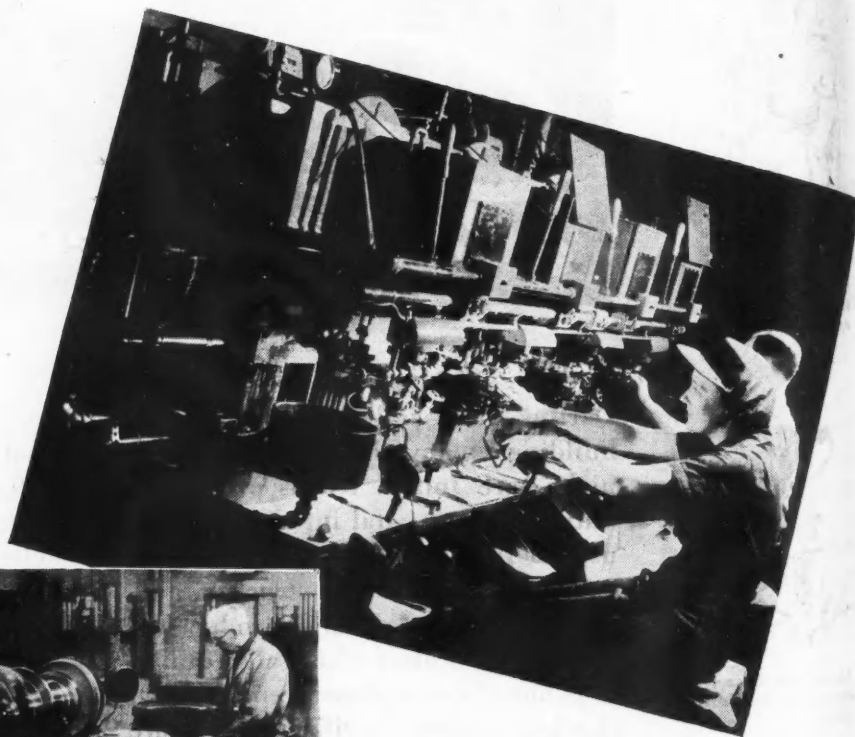
Final assembly of the main frame may be likened to aircraft practice during the war, where large sub-assemblies such as wings or fuselage sections were assembled in a massive steel fixture and riveted or welded while held in accurate alignment. The bulkheads and other parts that go into the main frame are fitted accurately into a massive master welding fixture and are "tack" and "root" welded in place. This initial operation takes in the major portion of the details and sub-assemblies that make up the frame. A feature of the master welding fixture

is the use of a multiplicity of machined rods, running from one side of the fixture to the other, which fit in reamed holes in the sides of the fixture and serve to provide an accurate alignment of the bulkheads during welding. The fixture is machined to a tolerance of plus or minus 0.002 in. at all critical points with special provisions for making suitable adjustments for shrinkage in the major constructional planes.

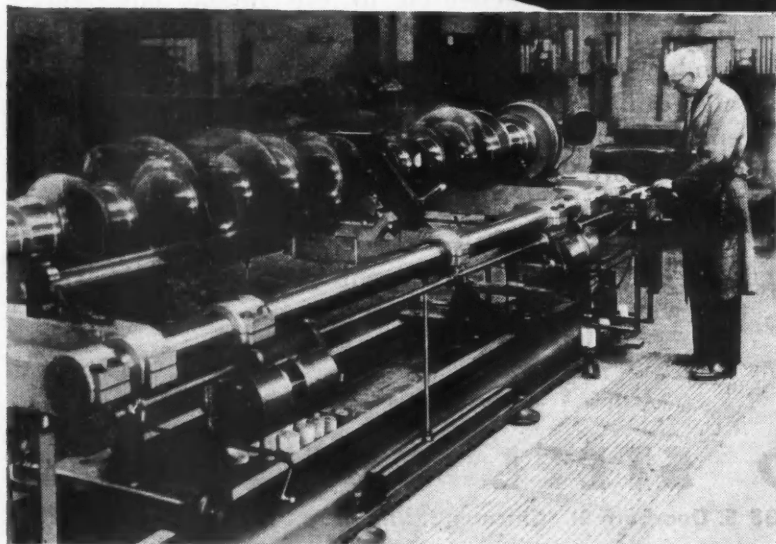
Another important feature of the fixture is a flexibility in construction to permit the assembly of frames for all combinations of cylinders from three to ten.

The tack-welded block now is removed from the fixture, fitted upon an enormous welding positioner, and completely welded in every detail. Final welding is done with the electric arc, using alternating current to prevent arc blow. This welding is done with a rigidly controlled production procedure so as to make it possible to shrink the entire structure to accurate dimensions. This involves welding in and out of the positioner, in a prescribed sequence, with carefully selected electrodes to insure fillets with concave surfaces, appropriate weld sizes, number of layers, layer sequences, and current values.

Upon completion of the welding cycle, the assembly
(Turn to page 112, please)

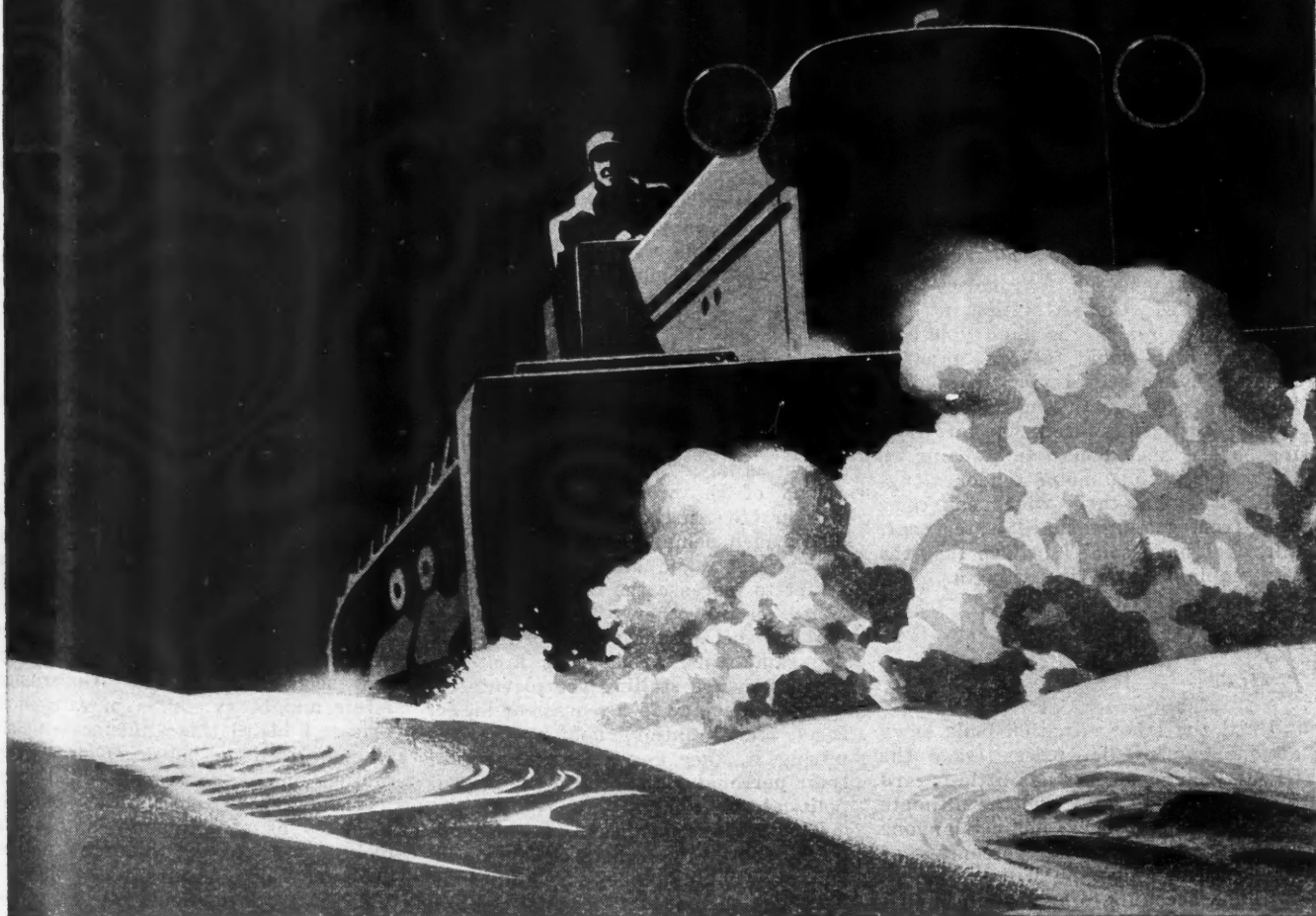


(Above) View in the department producing fuel injection pumps and nozzles. This shows one of the benches on which the nozzles are checked for calibration.



(Left) The Tinius Olsen crankshaft balancing machine is of outsize to accommodate the big O-P engine crankshaft. Here is the balancing operation using an Olsen No. 4S double compensator machine.

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39

Airbriefs

By Henry Lowe Brownback

The Big Flying Boat

It seems to be but a matter of time before the landplane will edge out the flying boat in anything but amphibious types of moderate size save on runs where it is impossible to build terminal facilities for the landplanes. The modern multi-motored landplane is sufficiently reliable to remove the hazard of having to make water landings and these, unless made under favorable conditions, are difficult and sometimes end in disaster with the great modern ships with their heavy loadings and high landing speeds. Anyone who has ever crossed the Atlantic in bad weather can realize the impossible conditions which would face the pilot of a large flying boat trying to land in the open ocean with engine or plane trouble during a storm. The large flying boat is spectacular and, sitting on the water with a motor tender alongside, gives that thrill which can come only from getting aboard water craft but, as I have said, I believe that the big seaplane is on the way out save for limited services.

Prices

Until the labor situation boils down no one can predict prices (save the OPA which sometimes has little regard for costs and profits) and the ultimate value of the currency, nor can anyone predict, at present, what percentage of your income and mine will remain in our bank accounts to be used in buying new things. With the present prices of private aircraft and the present tax set-up the market for private aircraft is going to be limited. The average man looks upon an \$1800 car as costly and there is nothing to make him look on an airplane costing twice that amount as low priced, especially if he must pay a large percentage of what he makes in taxes, which are swelled by political schemes to pay people for not working.

The \$3600 figure is not far from the price which will be asked for a family plane capable of going 'cross country and when one investigates the market possibilities of the \$3600 car he gets an idea of the limits of the market. I believe that every workman is worthy of his hire and of the truth of the

thesis that you should pay the highest possible wages so as to expand buying power. Only in this way can you get the production volume needed to bring prices down to the point where you and I can afford machines which would otherwise be limited to the purse of a millionaire. That is commonsense and part of the basis of our prosperity and our standard of living.

On the other hand, prices must be kept down in order to permit everyone to buy and this can only be done by making every workman so productive that his wage per piece is very low even though his wage per hour is high. Here again the motor car industry led the field. Had this combination been allowed a clear field there would have been no limit to the heights which American mass production genius would have brought our people, but it has been brought to a partial halt by a selfish group of super politicians known as labor "leaders" posing as the friend of the worker and using the worker to further their ambitions. These men demand ever higher wages on the one hand and limit every attempt to increase the worker's productivity on the other. Thus instead of making the worker gain more and at the same time produce at less cost, these men are stalling the private enterprise machine in a morass of higher costs and inflation, hoping that by miring it, they can take it over for their personal gain in either money or political power.

The airplane business is at the point today where any such tactics may well ruin it. The airplane, as we know it, is largely the product of craftsmen and the present airline and military market can support an industry of very limited size. If safe private airplanes can be produced at reasonable cost in mass production there will be room for large manufacturing staffs and widespread sales and service organizations, but if labor resists every attempt to make it more productive and strikes every time operations are speeded up or methods improved, no one will have a job at any wages.

Speed

I am often asked how predicted speeds will be made by long distance airplanes when one considers the break-

down of efficiency of wings and propellers when the speed of sound is approached. The truth is that these proposed or prophesied speeds will be made at very high altitudes where the air is rarified and, therefore, the speed of sound is far higher than it is lower down. The speed of sound and the critical speeds of airfoils vary greatly with air density.

Courtesy

If transportation companies could realize and force their employees to realize how much courtesy pays they would gain much. During the war the railways have performed miracles, but their ticket agents and train crews have soured the public to no mean degree. On the other hand the airline ticket agent made you feel that he felt personal sorrow when his line could not carry you and you want to try him again. The same thing holds good for the airline stewardess. I have traveled on lines with both made and female stewards and there is no comparison in the enjoyment of the trip. If any one factor, save speed, has swung trade to the airlines it has been the courtesy and smiling good-fellowship of the girls who make the passengers on our airlines comfortable.

Changes

Change creeps up on us so fast that we cannot realize how life progresses unless we suddenly find ourselves face to face with things of the past. I was forcibly reminded of this when the radio announced the start of the first "Round the World" flight of the new AAF passenger service, which I hope will soon cease to be a Government affair and be run by a private enterprise. I heard this announcement sitting in a little house on Deer Isle, Maine—one of the few unspoiled places left along the Atlantic Coast—once the property of a "Clipper" captain who took a year to do what the modern "Clipper Plane" captain can do in a few days. We should all remember that, before the days of the war between the States, American Clippers reigned supreme on the seven seas and were only driven out of their supremacy by the British steamships, we having put our faith in sail. With the tremendous strides made by the United States in long distance aircraft during the late war we should again take our leading place in long distance overseas travel if we are not "traded" out of it by inept politicians playing at international statesmanship.

We can never buck foreign steamship competition without tremendous subsidies as immense passenger ships are largely hand-built and our workmen are paid wages which make them very costly as compared to European
(Turn to page 56, please)

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Permatex Form-A-Gasket No. 1
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Form-A-Gasket and Pipe Joint Cement
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uses to do the right job on gasket
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Strikes in Feeder Plants Still Trouble Industry

Sustained Automobile Production Threatened by Labor Disturbances in Factories of Parts Makers

With the resumption of automobile production Oct. 8 at both the Ford Motor Co. and Hudson Motor Car Co., an uncertain and partial peace came to the automotive industry. Termination of the Kelsey-Hayes Wheel Co. strike in what was an apparent victory for management permitted Ford to reopen after having been closed down since Sept. 14. Work at Hudson, down since Sept. 1 because of a walkout by 500 foremen, was resumed when the strikers voted to return to work. The company had just started production of its 1946 models when the shutdown occurred. Ford had been in production since July 3.

Although the resumption of automobile building is heartening, optimism must be tempered with the realization that several parts makers still are plagued with strikes, and there is no assurance that production can be long sustained if stoppages continue in feeder plants. M. L. Bricker, general superintendent at Ford, made it clear that settlement of strikes among suppliers would dictate how long production will continue. Seventeen of the company's suppliers were strike bound when the plant closed. It is understood that Ford has been able to build up a fair backlog of parts during the Kelsey strike by scavenging branch plants and in some cases possibly from purchase of excess government stocks. Obviously, anything like full scale production will have to wait for a stabilized labor situation in the parts industry.

Even though the clouds hanging over the automotive industry have broken away temporarily, the atmosphere still is charged with ominous tension. Chrysler Corp. and GM units have filed strike vote notices, and both companies now are conducting talks with union representatives on wage increase demands. Henry Ford II, president of Ford Motor Co., announced that his company expects to build approximately 75,000 passenger cars and 50,000 trucks yet this year, but his words hardly were cold before Richard T. Leonard, National UAW Ford director, announced that a petition for a strike vote at all Ford plants would be filed with the National Labor Relations Board on Oct. 8. The GM vote is scheduled for Oct. 24, and

for Chrysler workers Oct. 25. The Ford vote probably will be set for Nov. 7. In all cases the 30 per cent wage increase is the principal demand.

From the firm stand taken by the Kelsey-Hayes management and the action of GM in meeting head-on the union challenge for a 30 per cent pay increase, it is apparent that management is going to stiffen its resistance to unreasonable union demands. The urgent compulsion of war is no longer a fetter on the industry, and the issues

involved now are so fundamental both to industry and the country as a whole that any further retreating seems to be out of the question.

A careful reading of the letter sent by Chas. W. Wilson, head of GM, to Walter Ruether, head of the GM division of the UAW-CIO, rejecting the 30 per cent pay demand as unreasonable, reveals that the corporation does not rule out the possibility of arriving at—"A sound and equitable solution that will put people back into productive work and create more good jobs." In fact, on the day that the letter of rejection was made public, GM met with the union to discuss the demands, and the talks still are continuing. Counter proposals doubtless will be made by the corporation, but thus far nothing of a definite nature has been forthcoming.

While all the emphasis thus far has been on a 30 per cent pay increase for

(Turn to page 119, please)

Automotive Demand Presses Steel Market Despite Interruptions

Paucity of the Available Supply of Semi-Skilled Steel Mill Labor Continues but Little Relieved

By W. C. Hirsch

That automotive demand features the steel market in spite of numerous interruptions in the flow of material from mills to consumers, is seen from the influx of orders for so-called "aluminum-killed" sheets which carry an extra charge of \$5 per net ton. These deoxidized sheets, considered to be non-ageing, were especially developed to meet the heavy demand for sheets that will stand up under deep drawing to which they are subjected so as to conform to the prevailing design tendency. They obviate, moreover, much of the risk entailed in the building up of reserve stocks by spoilage through atmospheric deterioration while in customers' warehouses, and, therefore, permit the building up of "banks" to provide for later requirements. To get a place on mills' order books for deliveries during the year's final quarter is still very much of a job, and with a good many consumers fearing that the return of more orderly production conditions in the automobile industry will also witness an unprecedented rush for additional flat rolled steel supplies, as much protection against this eventuality as possible is being sought. What with many changes in basing points and

more intensive study of production costs, overhauling of the entire steel price structure in the near future is expected generally.

Paucity of the available supply of certain classes of semi-skilled steel mill labor continues but little relieved. The process of regaining discharged veterans for their usual peace-time occupations is progressive, but disappointingly slow. It is this shortage of the right kind of labor to which steel producers ascribe the major share of their production difficulties, which in some cases has resulted in informal rationing. In some descriptions of finished steel it is possible to scale output close to the nearby demand, but prevailing conditions shed so little light on what changes may take place in a month or two that output is being held down to a minimum. Even items in which interest appears to be little more than lukewarm encounter long delays in shipment. Although war steel cancellations are rather slow in coming through in the case of some of the smaller steel mills, the worst kinks are said to have been ironed out and the end of October is expected to bring virtually a clean slate with only minor adjustments hanging fire.



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right steer

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Plastics, of course, are well-known to the automotive and aviation industries. In your search for better materials, you—designers, engineers, manufacturers—have long recognized their value.

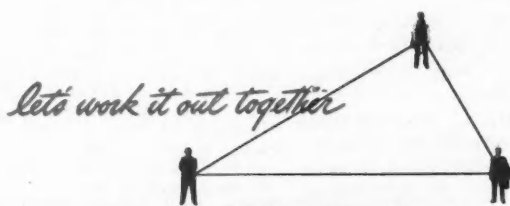
But continuing developments, bringing stronger, finer, more beautiful plastics, presage an even greater use of these improved materials in post-war automobiles and airplanes.

Take, for example, this new plastic steering wheel. Certainly, its bright, smooth finish appeals to sight and touch. But, more than that—this wheel is strong, tough and durable. It's made of ETHOCEL, a product of Dow's endless working toward better materials.

With this wheel, there is no splitting when metal inserts are properly employed. Splitting sometimes did occur before improved materials like ETHOCEL, designed to meet the hard demands of war, were available. ETHOCEL more than meets the strain because it maintains its dimensional stability throughout a wide range of temperatures.

ETHOCEL is a "right steer" on plastics. This and other Dow plastics are a worthy accompaniment to tomorrow's cars and planes.

ETHOCEL



High accomplishment in plastics will result only when manufacturer, designer, fabricator and raw materials producer put their skills together, working as a team. In the interests of achievement, therefore, Dow urges you to save time and money by putting its experts to work on your problem. They'll do their part.

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Gray Iron Castings Now Another Reconversion Bottleneck

Shortage of Labor and Restrictive Price Ceilings On Certain Types of Castings Delay Production

Shortage of labor in foundries, coupled with restrictive price ceilings on certain types of castings, is giving the automotive industry considerable trouble in getting certain gray iron castings needed for reconversion. The principal difficulty is a shortage of skilled molders, but even in less skilled operations, the manpower problem is troublesome.

A manufacturer of gray iron castings says that he lost many of his molders to the armed forces, and that they are not returning to their old jobs after discharge, probably because of the hot, dirty, and generally uncomfortable working conditions. Unemployment has not helped the situation much, either in skilled or unskilled classifications. A USES spokesman in Detroit says that while there are hundreds of jobs open for common foundry labor at the same or higher wages than prevail in other industries, there are few takers. He said, however, that the situation is expected to ease up this winter.

The price situation also is working to bottle up production of certain types of castings. A typical example is that of one company that before the war was supplying brake drum castings to an old customer at 4 cents a lb. It continued to supply them at the ceiling figure during the war for patriotic reasons, even though it took a loss on each one, because it could make up the loss out of profits on overall operations. However, now that the war is over, it has stopped making the particular item because it can no longer afford to take the loss. As a result, the customer must move his patterns to another shop, which can charge a higher price through a formula allowing increased labor and material costs because it is a new job. There has been considerable shifting of supply sources because of this situation. To avert such job shuffling, OPA has increased base period ceilings 10 per cent on gray iron castings, but spokesmen for the foundrymen say the increase still is not enough on many items to warrant their continued production.

Another complication is that some foundries have an overall ceiling beyond which they cannot go for any kind of casting regardless of type. As a result, many automotive companies with intricate patterns are turned down because the cost of production exceeds the maximum ceiling. They must then attempt to find a foundry with a ceiling high enough to cover the production cost, a most difficult problem, since all foundries surveyed stated they were jammed to capacity and that future orders were clogging the books.

One foundryman pointed out that automotive buyers who were very tough on price before the war now are willingly paying ceilings without quibbling. He did not explain just how much more percentage-wise is being paid for castings than before the war, but intimated it is substantial.

Several automotive companies, of course, have "captive" foundries, but it is reported that even so they cannot meet all needs. Production has been falling in the castings industry since last March, and while the backlog of orders for war castings has fallen off, it is expected that the huge peacetime demand will send the backlog well over the wartime peak later in the year. And when reconversion is completed and production lines in all industries begin to roll, the demand will swamp all available capacity, according to foundrymen. In obvious expectation of a critical situation, most of the automobile companies have expanded and modernized their own foundries for increased production.

Counter Offensive Against Attacks on Patent System

Plans for a counter offensive against widely publicized attacks on the U. S. Patent System are being made by a nationwide group of smaller manufacturers, representing 28 classes of industries, according to an announcement by John W. Anderson, president, The Anderson Company, Gary, Indiana, leader of the movement.

The new organization, incorporated as National Patent Council, will be controlled by smaller manufacturers. Headquarters will be at Gary, Ind. Offices will be opened in New York and on the Pacific Coast.

"Although the vociferous critics of the Patent System profess to be saving the country from monopoly, they are in reality promoting monopoly by threatening the life of every smaller company relying upon patents," said Mr. Anderson.

"Individually, we have been shouting as loudly as we could, with little effect. Now smaller manufacturers join forces in National Patent Council, to appeal directly to the fair-minded American people to get the misled 'reformers' off our necks so we can plan jobs and products for higher levels of good living."

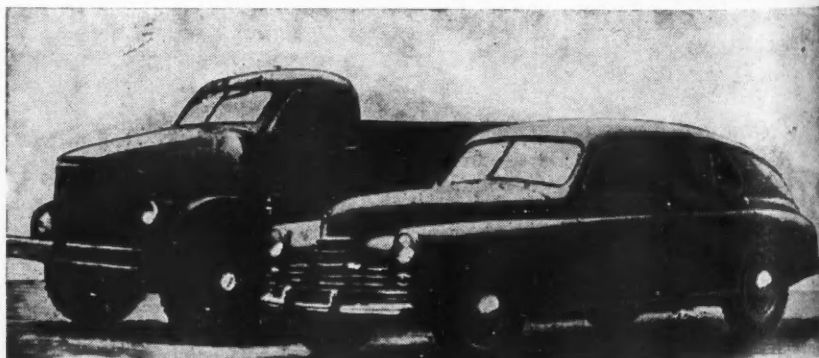
Council policy, Mr. Anderson said, will be determined by a board of five governors, made up exclusively of smaller manufacturers, and the governors, in turn, will be responsible to representative regional chairmen, also smaller manufacturers. Some 200 leading patent lawyers already have volunteered their services on technical patent matters as advisory associates of the Council.

CALENDAR

Conventions and Meetings

- American Society for Testing Materials, New York City, Research Materials Meeting Oct. 25
- Contest Board of the American Automobile Assoc., New York City, N. Y. Annual Meeting Oct. 25-27
- SAE Fuels and Lubricants Meeting, Tulsa, Okla., Lubricants Meeting Nov. 6-7
- Assoc. of American Battery Manufacturers, Chicago, Ill. Annual Meeting Nov. 1-3
- National Metal Trades Assoc., Cleveland, Ohio, Annual Convention Nov. 16-17
- American Society of Mechanical Engineers, New York City, N. Y., Annual Meeting Nov. 26-30
- SAE Natl. Air Transport Engineering Meeting, Chicago, Ill. Dec. 3-5
- SAE Annual Meeting and Engineering Display, New York, N. Y. Jan. 7-11
- SAE Natl. Aeronautic Meeting, New York, N. Y. April 3-5
- Natl. Assoc. of Corrosion Engineers, Kansas City, Mo., Annual Meeting and Convention May 7-9
- National Aviation Clinic, Oklahoma City, Okla., 1945 National Clinic Nov. 19-21

New Russian Truck and Passenger Car



These models will be produced by the Molotov Automobile Works during the fourth five-year plan period. Illustration shows the "GAZ" motor truck and the "Victory" passenger car. Photo by Sovfoto

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TRIES

At this control station molding sand is blended to produce smooth, perfect castings. Sand must be tested every 15 minutes.

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PERSONALS

Recent appointments among Automotive and Aviation Manufacturers:

Curtiss-Wright Corp., Robert L. Earle, Vice-Pres. in charge of Airplane and Propeller Divs.; F. H. Harrison, Vice-Pres. and Gen. Mgr., Airplane Div.; L. R. Crandall elected to Board of Directors.

Kaiser-Frazer Corp., Clay Beford elected member of Board of Directors.

Landis Tool Co., R. F. Ingram, Secretary and Vice Pres.; W. P. Lotz, General Sales Mgr.

Willys-Overland Motors, Inc., Philip C. Johnson, Administrative Asst., and Walter R. Benning, Chief Engineer of Chassis Div.

General Motors Corp., W. J. Davidson, Administrative Engineer, and Col. A. J. Schamehorn, Asst. Administrative Engineer, General Motors' Technical Center; Lyle A. Walsh, Mgr. of Operations Advanced Engineering Section; C. F. Kettering, Research Laboratories; B. D. Kunkle, Process Development, and H. J. Earl, Styling Section.

Allegheny Ludlum Steel Corp., Clark W. King, Executive Asst.

General Motors Corp., Chevrolet Div., E. A. Nimnicht, Asst. General Sales Mgr., has announced his retirement.

GMC Truck & Coach Div., Grant Sturgis, Development Engineer, Parts and Service Operations.

E. I. du Pont de Nemours and Co., Benjamin M. May, General Mgr. Rayon Dept.

The Rogers Diesel and Aircraft Corp., Frank B. Carbone, Asst. to the President, Ralph B. Rogers.

The Weatherhead Co., Leonard C. Doolittle, Industrial Hose Sales Engineer.

Waukesha Motor Co., Walter Frame elected a director of the company; C. P. Ross, Secretary; Louis W. Youker, Asst. Secretary.

American Brake Shoe Co., Ramapo Ajax Div., John S. Hutchins elected president.

Evans Products Co., Edward S. Evans, Jr., elected President, succeeding the late E. S. Evans, his father; Prewitt Semmes elected a member of the board.

Shellmar Products Co., T. R. Baxter, Package Development Mgr.; T. K. Almroth,

(Turn to page 85, please)

Procedure for Disposal of Surplus Automotive Parts

Apparently, procedure for disposal of excess standard automotive parts through the Office of Surplus Property of the Department of Commerce has been revised somewhat. Originally, information supplied us by one official indicated that eligible buyers were to go to the nearest branch office of OSP to look over catalogs for any items they wished to buy. More recent information states that the buyer need only to consult the current parts price list of the manufacturer of the vehicle for which he needs parts. He then sends the manufacturer's parts number, together with the quantity desired, to his nearest OSP branch office, where the part is checked for availability, interchangeability, and location and number in military stocks.

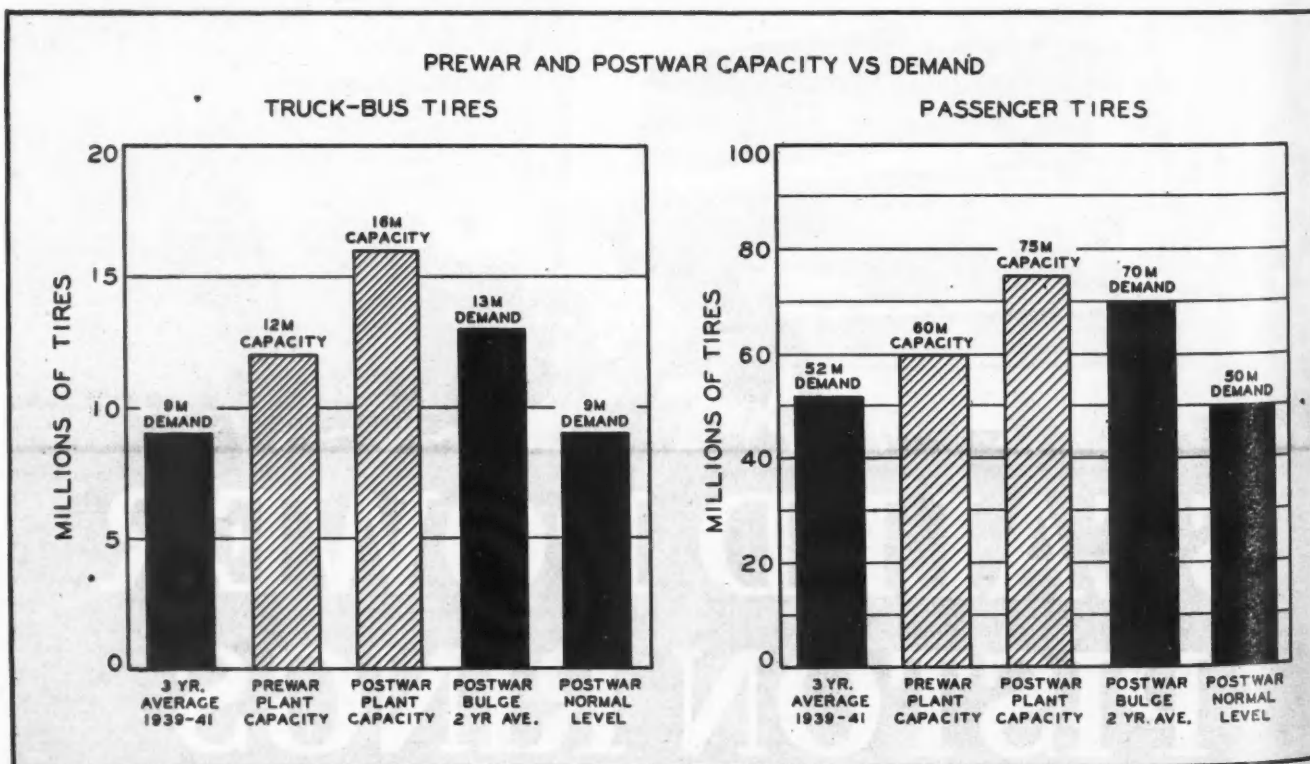
Since OSP has not compiled an inventory of particular items, it does little good to write or call branch offices for such a list. If the buyer is not certain that a particular part he wants is interchangeable with those in

military stocks, he should send in his order listing the number of the vehicle for which the part is needed. It will be interpreted in Detroit from an interchangeability list maintained by Ordnance.

Vehicle and parts manufacturers are now also eligible to purchase excess stocks of standard parts. Negotiations are conducted only in Detroit, however, and on a basis of list price, to which is applied a suitable discount.

Tooling Information Service

The automotive Tool and Die Mfrs. Assn. has announced that it will continue publication of the Tooling Information Service which was carried on during the war by the Automotive Council for War Production. The Tool and Die Assn. was a member of the Council before its dissolution Oct. 1, and was an important cooperator in publishing the tooling service. Starting Oct. 20, the reports will be issued twice a month. Irwin A. Prabel, engineer, who has been conducting the tooling information service, will continue to supervise publication of the reports, which list open available tooling capacity together with information on number of employees, designing facilities, types of jigs, fixtures, gauges, cutting tools, dies and other equipment. The Association states that a clearing house for such information is an important factor in reconversion.



Abrupt ending of the Japanese war, cut-backs in proposed expansion of existing facilities, and cancellations of new plants are reflected in charts, issued by the statistician's office of the Goodyear Tire & Rubber Co., showing the rubber industry's postwar tire production capacity.

DESIGNING FOR DIE CASTING



RIBS

In designing die castings, consider the use of ribs where one or more of the following results are desired:

1. Maximum strength, especially in resistance to bending.
2. Decreased weight.
3. Avoidance of warpage under stress.
4. Uniformity in section thickness.
5. Adequate stress distribution.
6. Assurance of filling out thin sections.

All of these results have been obtained in the ZINC Alloy Die Casting for the aircraft machine gun mount shown here. Through the intelligent use of ribs, this casting has ample strength with a minimum section thickness—thereby decreasing weight and cost. The section thickness is substan-

tially uniform and the chance of warpage is minimized. The ribs also help to distribute stresses applied at the steel shank which has been cast in place at the center of the casting. This shank serves as a pivot pin on which a pair of guns and their mounts are supported and about which they rock.

For more detailed information on this and other design considerations which will enable you to get the most for your die casting dollar, ask us—or your die casting source—for a copy of **DESIGNING FOR DIE CASTING**.



ZINC

FOR DIE CASTING ALLOYS

THE NEW JERSEY ZINC COMPANY, 160 Front St., New York 7, N. Y.

The Research was done, the Alloys were developed, and most Die Castings are specified with
HORSE HEAD SPECIAL (99.99+%) **ZINC**
 Uniform Quality

Ford's European Plants Hard Hit by War

Possibility for early resumption of business in Europe by Ford Motor Co. are not bright, according to R. I. Roberge, in charge of foreign operations for the company, who returned recently from a tour of Ford plants there. The Poissy plant (16 miles from Paris) was badly damaged by bombing during the war, but damage has been largely repaired. The Cologne plant, badly hit by German mortar fire is structurally in good shape, but the roof, glass, and interior of the offices are in

very bad condition. The machinery, however, is practically intact. The Antwerp plant was bombed on several occasions, and the craneway building was totally demolished. The assembly plant, however, has been repaired. The plant at Dagenham, England, had been hit many times during the war, but not seriously since October, 1940. Roberge reported that in most European countries there is a great shortage of food, coal, and clothing. They also need trucks and presumably many Army vehicles will be delivered to the various governments to take care of the immediate transportation shortage.



FOR highly stressed parts, it is an undisputed fact that there is no substitute for forgings. While high individual properties can be obtained by other methods of fabrication, the forging process develops the greatest combination of physical properties (tensile and compressive strength, ductility, impact and fatigue strength) and the greatest uniformity of quality of any method of manufacturing metallic shapes. Forgings are the ultimate as far as a combination of strength and toughness is concerned.

WYMAN-GORDON

Forgings of Aluminum, Magnesium, Steel
WORCESTER, MASSACHUSETTS, U. S. A.

HARVEY, ILLINOIS

DETROIT, MICHIGAN

Business in Brief

*Written by the Guaranty Trust Co.,
New York, Exclusively for AUTO-
MOTIVE AND AVIATION INDUSTRIES*

Narrow fluctuations of business activity at reduced levels are indicated by current reports. *The New York Times* index for the week ended September 22 stands at 121.7, as against 125.9 for the preceding week and 137.5 a year ago.

Sales of department stores, as reported by the Federal Reserve Board, for the week ended September 22 were 14 per cent greater than those in the corresponding period last year. The total for the year to date is 11 per cent above the comparable 1944 figure.

Electric power production during the week ended September 29 was 7.5 per cent smaller than a year ago, as against a comparable decline of 8.2 per cent in the preceding week.

Railway freight loadings during the week ended September 22 totaled 837,293 cars, showing a decline of 2.2 per cent from the figure for the preceding week and a level 6.7 per cent below that for the corresponding period last year.

Crude oil production in the final week of September averaged 4,357,450 barrels daily, as against 4,527,550 barrels a week earlier and 4,762,300 barrels a year ago.

Bituminous coal production during the week ended September 22 totaled 11,600,000 net tons, which is 575,000 tons below the output for the preceding week and 366,000 tons below that for the corresponding period last year. Total production for the year to that date is 7 per cent less than the comparable 1944 figure.

Civil engineering construction contracts awarded during the week ended October 4 were the third highest weekly sum for the year to that date, according to *Engineering News-Record*, totaling \$74,731,000, which is 16 per cent below the figure for the preceding week, the 1945 peak so far reported, but is 132 per cent above the corresponding amount last year. The total value of contracts recorded in 1945 is 12 per cent above the comparable sum shown a year ago.

The wholesale price index of the Bureau of Labor Statistics for the week ended September 22 recorded a reversal of trend, standing at 104.9 per cent of the 1926 average, as against 104.7 a week earlier and 103.7 a year ago.

Member bank reserves declined \$278,000,000 during the week ended September 26, mainly because of an increase of \$533,000,000 in Treasury deposits with the Federal Reserve banks, partly offset by a rise of \$185,000,000 in Reserve bank credit outstanding and a decrease of \$48,000,000 in the amount of money in circulation. Loans and investments of reporting member banks during the same period declined \$333,000,000, including a reduction of \$11,000,000 in commercial, industrial and agricultural loans.

Advertising Note

Donald D. Dilworth, former Account Executive of Kenyon and Eckhardt, New York advertising agency, has joined the staff of Klau-Van Pietersom-Dunlap Associates, Inc., Milwaukee, Wis.

...Here's One

Extensive metallurgical research is resulting in new manufacturing economies while turning out higher quality parts and products. The motor end frame is one of several typical jobs employing an alloy in preference to cast iron.

The aluminum alloy part presented an extreme chucking problem due to its 6.741" diameter and fragile 1/8" section. The selection of New Britain 88's proved to be the solution. Twenty-two (22) well-placed tools in eight positions are required to completely machine the rough casting . . . a part every 11.8 seconds. The machines are running 574 R.P.M. and produce 305 motor end frames per hour.

FIRST POSITION

Load in two-jaw hydraulically operated chucks.

SECOND POSITION

Face end of skirt from cross arm — Core Drill .7775 diameter — Rough turn 6.738 diameter.

Face end of hub.

THIRD POSITION

Core drill 1 1/8" diameter and 15/16" diameter. Rough turn 1.330 diameter.

FOURTH POSITION

Single point bore .7775 and 1 1/8" diameters. Rough turn 1.433 diameter.

FIFTH POSITION

Single point bore .7775 and 1 1/8" diameters and chamfer 1 1/8" diameter. Semi-finish turn 6.738 diameter.

SIXTH POSITION

Finish face side of skirt from cross arm. Rough recess both grooves.

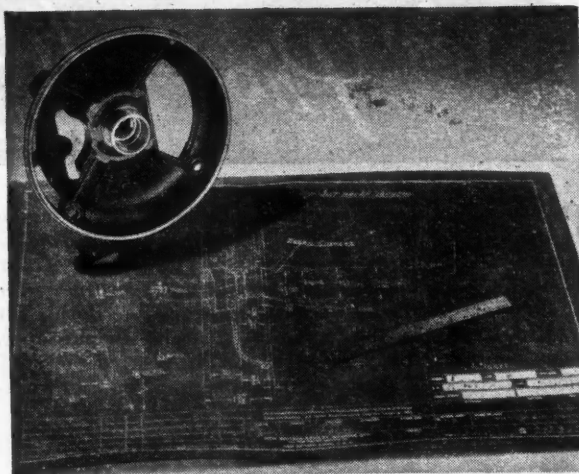
SEVENTH POSITION

Finish recess both grooves.

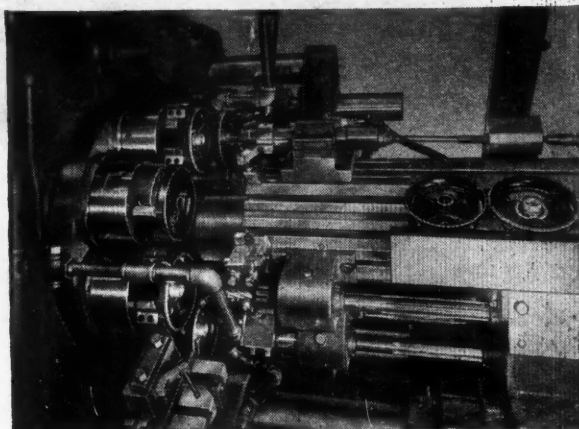
EIGHTH POSITION

Ream .7775 diameter — Finish turn and chamfer.

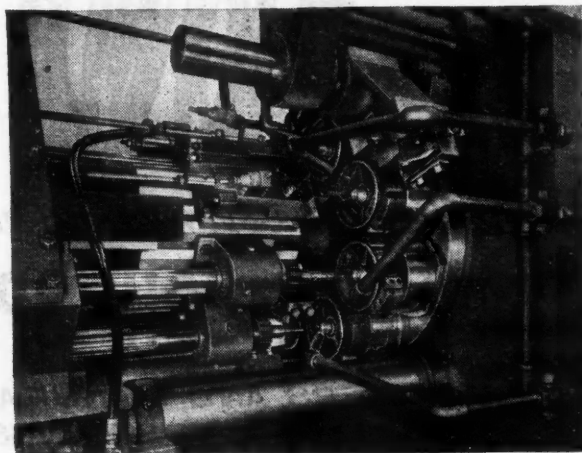
This difficult machining of an aluminum alloy motor end frame is but one of many outstanding applications of New Britain automatics . . . bar and chucking machines that are establishing new records daily for accurate and economical production. To manufacture your peacetime quality product at less cost . . . machine it on a New Britain multiple spindle automatic.



Finished Aluminum Alloy Motor End Frame machined to exacting tolerances.



Front View of a New Britain Model 88 used in finishing the motor end frame . . . Note accessibility through open end construction.



Rear View of a Model 88 shows relationship of cross arms to toolholders . . . Permitting more efficient tool layout and production.

The New Britain machine line includes four, six and eight multiple spindle automatic bar machines up to 2 1/4" capacity. Also a wide range of four, six and eight multiple spindle automatic chucking machines up to 12" capacity.

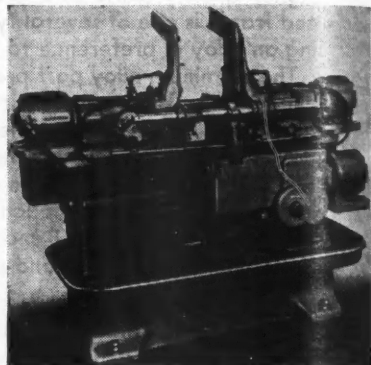
New Production Equipment

PRATT & WHITNEY, Division of Niles-Bement-Pond Co., West Hartford, Conn., has brought out a 1½-in. by 18-in. full automatic centering machine capable of producing accurate, properly centralized and lined-up center holes simultaneously in each end of a piece of stock. Except for initial setup,

the machine requires only keeping the magazine supplied with work, taking away centered parts and caring for the ordinary center drills used.

Both ends of the work are centered in one operation with the drills being fed in conjunction with a full automatic work-handling mechanism. The

drills are withdrawn twice during the operation, to clear out chips and permit oil to enter the drilled holes. The cam path controlling this feed is arranged in three steps so that after each withdrawal, the center drills go in to a greater depth—reaching full depth at the last advance. The two drill spindles are mounted in preloaded ball bearings



P & W centering machine



"It's always Springtime at our house"

AMERICAN COIL SPRING CO.

**DESIGNERS AND MANUFACTURERS
OF ALL KINDS OF SPRINGS TO MEET
YOUR PARTICULAR REQUIREMENTS**

EXTENSION		COMPRESSION	WIRE FORMS	
TORSION			CLOCK	
FLAT			SPIRAL	

MAIN OFFICES AT
MUSKEGON

SALES OFFICES:
CHICAGO - MILWAUKEE - ST. PAUL - DETROIT

inside quills, which, in turn, are actuated by a rack and pinion feed through spring resilient levers. Both drill heads can be adjusted on the bed to any desired position and then positively clamped. Each is driven by a ½-hp foot-mounted motor which permits easy motor replacement. Oil is supplied continuously to the drills from a gear pump, and surplus oil drains to a tank underneath.

The magazine holds the work and allows it to feed down by gravity to the transfer slides. The magazine ways have adjustable guides to accommodate work ranging from ¾ in. up to 1½-in. diameter. The magazine may be set to accommodate a range of work varying from a minimum length of 3½ in. to a maximum length of 18 in.

The length of stroke of the drill spindle can be varied from ¾ in. to 1¼ in., and the maximum countersink diameter is ¾ in. Stops are provided to limit the forward movements of the drill spindles.

The machine is supplied with change gears which provide four different camshaft speeds of 2.9, 4.3, 6.1 and 9 cycles per minute. Two sets of collets, 3/10 in. and 7/16 in. are provided—while other sizes are available on special order.

LIGHT METAL MACHINERY, INC., Erie Pa., is building a low-priced die casting machine for the production of small zinc, tin and lead alloys.

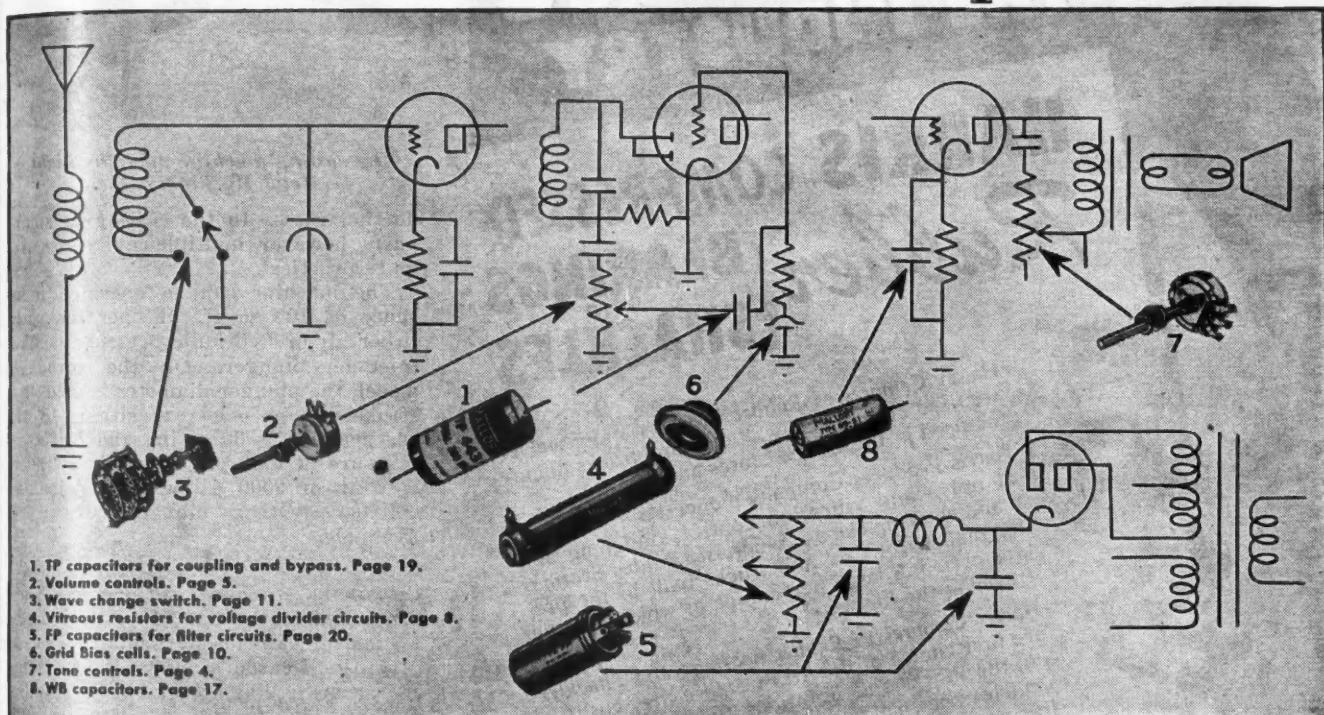
The characteristics of the machine are as follows: Its casting cycle is completely automatic, with die movement, injection and ejection all actuated by one mechanism. It has four operating speeds—266, 400, 639 and 882 shots per hour—predetermined by the size and weight of the casting being made. Because of these extremely high cycling speeds, castings can be made in a single cavity die at economical prices.

(Turn to page 54, please)

Save on Cost and Speed Delivery

Specify **MALLORY**

Standard Electronic Components



1. TP capacitors for coupling and bypass. Page 19.
2. Volume controls. Page 5.
3. Wave change switch. Page 11.
4. Vitreous resistors for voltage divider circuits. Page 8.
5. FP capacitors for filter circuits. Page 20.
6. Grid Bias cells. Page 10.
7. Tone controls. Page 4.
8. WB capacitors. Page 17.

WHETHER you need one part, or several, you will find your Mallory distributor probably has the part in stock, ready for immediate delivery. Mallory standard precision electronic components not only save costly tooling, but help to eliminate expensive production delays due to deferred delivery on "special" parts.

More and more, engineers and designers are taking advantage of multiple savings in time and costs by specifying Mallory standard circuit selector switches, plugs, jacks, volume controls, potentiometers, rheostats, vitreous resistors, dry electrolytic capacitors, dry-disc rectifiers, vibrators, power supplies, and other components.

Consult your nearest Mallory Distributor or write us for your copy of the complete and comprehensive Mallory catalog. Use it whenever you are specifying electronic parts. It has complete information on all parts as to sizes, capacities, mountings and supplemental hardware. Remember, Mallory approved precision electronic parts are carried in stock by Mallory distributors conveniently located throughout the United States and Canada.

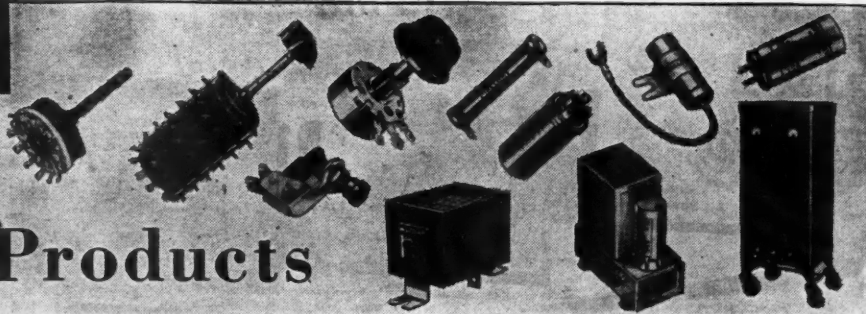


P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA



P. R. MALLORY & CO. Inc.
MALLORY

**Approved
Precision Products**



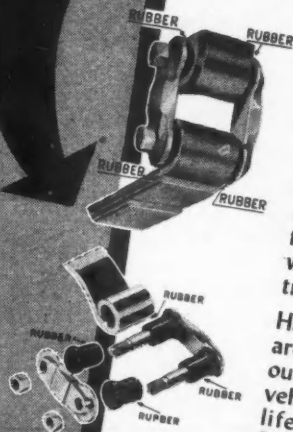
October 15, 1945

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

53

FIRST CHOICE OF THE INDUSTRY

HARRIS COMPRESSED Rubber BEARINGS AND SHACKLES



Harris Compressed Rubber Bearings and Shackles are used on practically all cars and trucks manufactured in the United States and Canada.

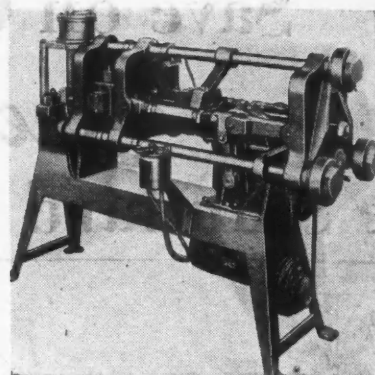
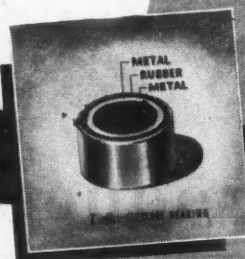
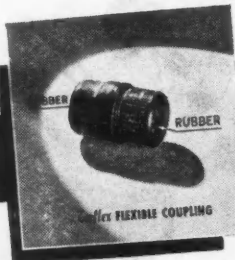
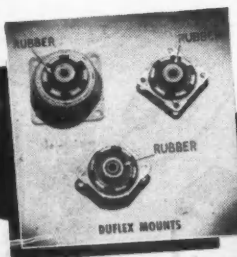
Harris Products Company pioneered in the field of noise and vibration control, designing and manufacturing Harris Compressed Rubber Bearings for millions of cars and trucks built in the pre-war period, a large percentage of which are still traveling the highways.

Harris Compressed Rubber Bearings and Shackles are first choice of industry because they cushion out the shocks and vibrations, thereby giving the vehicle quiet, smooth riding and prolonging its life considerably. Harris Compressed Rubber Bearings are used for radius rods, shock absorber links, suspension arms, spring shackles and other pivotal points of the chassis, proving the efficiency and economy of these bearings and clearly establishing their practicability for use for similar applications in other fields.

Harris Compressed Rubber Bearings are ideal for most oscillating bearing applications because they require no lubrication, operate noiselessly and without wear and are adapted to take radial, axial, and torque loads.

In prewar days and during the war we have solved many problems with Harris Compressed Rubber Bearings. Meeting new needs in our field efficiently and economically has been and is our business. If you have a problem our engineers welcome an opportunity of working with your engineers in its solution ... Just drop us a line.

HARRIS
PRODUCTS COMPANY
CLEVELAND 4, OHIO



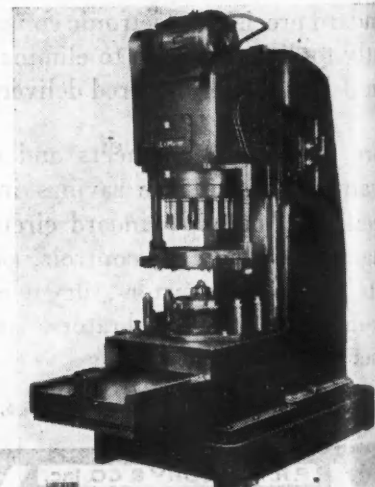
Die casting machine made by Light Metal Machinery, Inc.

duction rates. In the casting of small parts, however, multiple-cavity dies are quite practical.

The machine can be operated in a space of 100 sq ft. It operates with either air or hydraulic pressure on the injection plunger. On the standard model, the plunger diameter is 2 in., stroke is 4 in., shot capacity is 18 cu. casting area is 30 sq in., and injection pressure is 1000 psi if an air cylinder is used, or 2000 psi with a hydraulic cylinder. Other plunger sizes are available.

ANOTHER standard machine has been added to the line of vertical drilling machines made by LeMaire Tool & Mfg. Co., Dearborn, Mich. It was built for accurate single or multiple spindle drilling and boring of extra heavy parts; and is identified as Model No. 20.

The machine is furnished with a spindle having a milled drive slot for multiple head adaptation. Provision is



LeMaire Model No. 20 vertical drilling machine

made for a Morse taper adapter for single spindle operations.

The movement of the head for rapid advance and feed is actuated by means of a heavy-duty hydraulic cylinder mounted to the column between the ways, controlled by Vickers control panel. This illustration shows the machine equipped with 14 spindles set to (Turn to page 124, please)

CHATTER...CHATTER...CHATTER...

WAS RUINING FINISH

SUN TABLEWAY LUBRICANT...

Ended Chatter, Produced Smoother Operation, Cut Down Rejects

A midwestern manufacturer was unable to obtain a satisfactory finish in grinding hardened parts, because of excessive chatter in the grinding machines. When he used a heavy oil, the machines were sluggish. When he used a thin oil, the tableways chattered and affected the finish of the work.

After changing to Sun Tableway Lubricant, it was possible to maintain smoother operation, and to eliminate chattering.

Fewer rejects were encountered, and the management standardized on this Tableway Lubricant throughout the plant.

Sun Tableway Lubricant, with its extreme pressure characteristics and non-gumming qualities, is an outstanding example of Sun's industrial lubricants.

For every type, make, and size of industrial machine, for prime movers, conveyors, pumps, compressors, electrical equipment, etc., there is a specially prepared Sun oil or grease. Call in the Sun Engineer in your area and find out about the savings possible with the right lubricant in the right place.

SUN OIL COMPANY • Philadelphia 3, Pa.
Sponsors of the Sunoco News Voice of the Air — Lowell Thomas

SUNOCO

SUN INDUSTRIAL PRODUCTS

OILS FOR AMERICAN INDUSTRY

AIRBRIEFS

(Continued from page 40)

ships and our seamen make as much as most European officers. We know how to build aircraft at competitive prices and operate them on a competitive basis provided we can use our present prestige to arrange for foreign port facilities at decent rates and as low as those accorded any other operators.

The Army Transport Command has made a fine record, due in no small part to the pilots and equipment taken over by them or operated for them under contract by the private airlines and I

hope that the AAF will not try to blossom out as a Government substitute for the private overseas companies on certain routes. American prosperity has been accomplished by private capital and enterprise just as foreign poverty has been accomplished by attempts of Government to run business or to "plan" economy.

Inventors

When I was young the inventor was looked upon as a benefactor of humanity and rated with the composer, the artist and the writer as an original

worker. Later, led by the Germans, inventors were herded into great laboratories and their collective efforts used to create monopolies which became in time cartels. In fact much has been done to crush the inventor as an industrialistic unit with whom to deal. Like most original workers, inventors are difficult to discipline or to regiment. It has been difficult for management to integrate them into the modern mass production picture and they, being individualists, have refused to fit into the herded labor picture so the labor leaders have branded them as "anti-labor." As they have political power as individuals, the New Dealers have consistently pushed anti-inventor patent laws as part of their bloodless socialist revolution. All seem to forget that were the inventors to cease their efforts and stop inventing all progress would stop and the world would have no new things to serve it. Before engineers can calculate and designers can design the inventor has to invent.

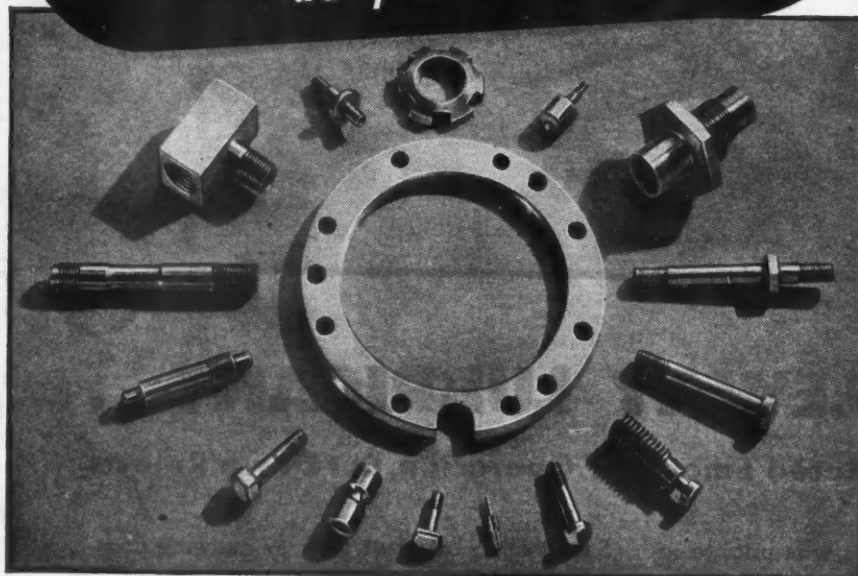
The latest blow at the inventor is the law passed by Congress and administered by the Armed Forces enabling these latter to review the royalty contracts existing between inventors and industry and then to alter these contracts as they please. Perhaps someone has invented something which never had a peace-time use but was needed by the millions during war. Naturally the inventor benefits but under the existing set-up some brass hat can come along and make his invention financially worthless or nearly so in spite of the fact that it may have saved countless lives and millions of dollars in property.

The baiting of the inventors, who have created everything which has taken us out of caves and animal skins to our modern standard of living, and trying to put them on a level with men who push buttons to stop and start machines is a disgrace to everyone connected with the attempt and it would be a good lesson for both government and industry were the original thinkers to quietly step out of the picture until such time as their stature is recognized and properly rewarded.

Department Stores

In the New York Times of a week ago I read an advertisement printed by one of New York's most noted department stores saying that they had taken the agency for one of America's most promising private planes. I can remember the early days of the motor car when the large department stores sold motor cars and their facilities helped get the infant industry on its feet. Department stores with their credit systems and their ability to stand starting off losses may well become an important factor in the sales field until the volume grows so large that the problems involved become too great for anything but specialized merchandizing and service organizations.

What kind of SCREW MACHINE PRODUCTS do you need?



Regardless of the number of intricate finishing operations required to complete the Screw Machine Products you need—you will find The Chicago Screw Company a dependable source of supply . . . For over 73 years we have specialized in the manufacture of screw machine and cold upset products in *any size, any shape* and in unlimited quantities.

All secondary operations are performed in our vast factory, and include Milling, Drilling, Broaching, Grinding of any type—precision Thread Rolling, Hydrogen Brazing, Electronic Heat Treating—all are accurately and rigidly controlled from rough stock to finished product.



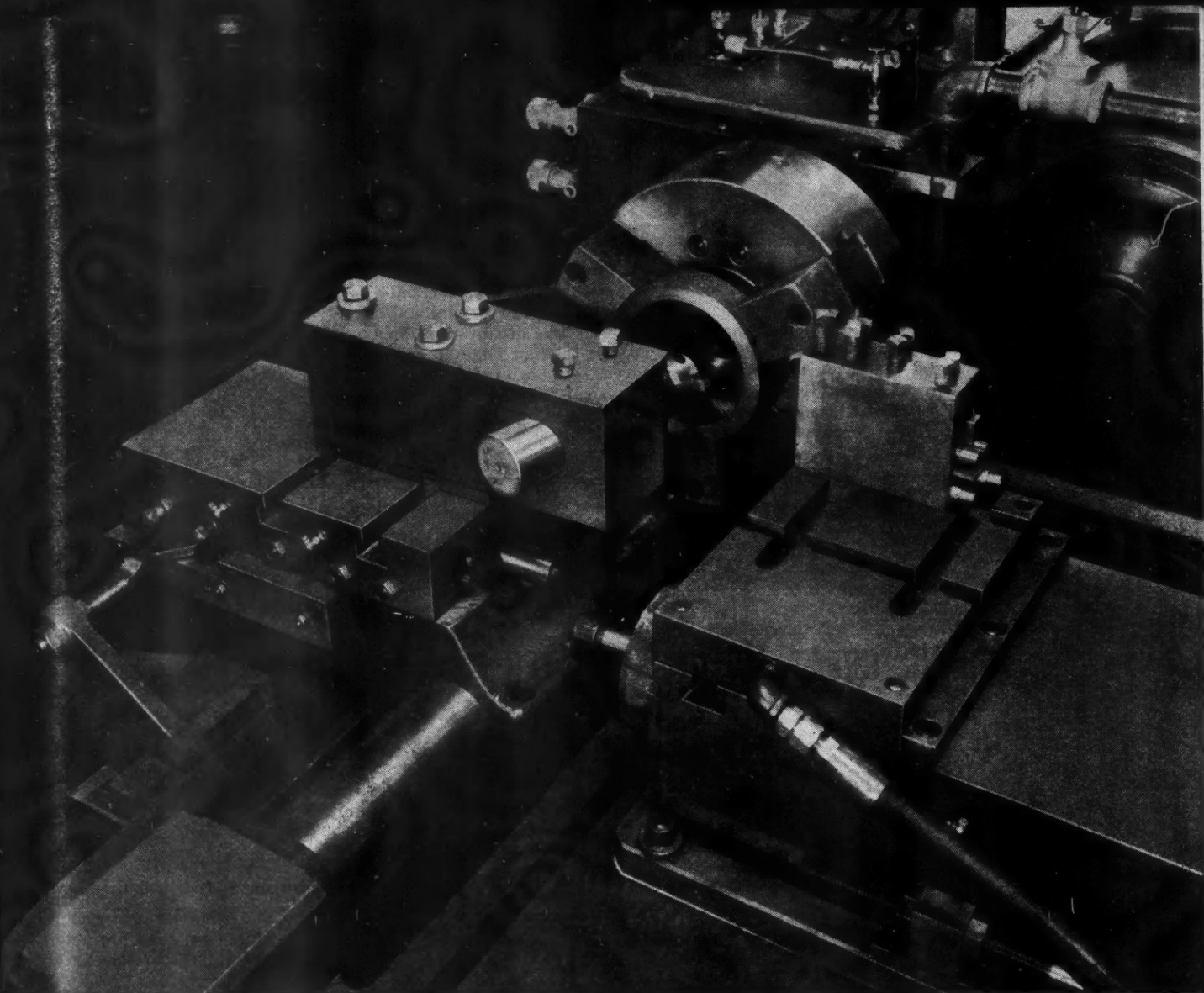
If your parts are simple screw machine items or really "fussy" jobs—try "Chicago Screw"—you'll find there is a difference.



THE CHICAGO SCREW CO.

ESTABLISHED 1872

1026 SO. HOMAN AVENUE CHICAGO 24, ILL.



Why this AUTOMATIC LATHE maintains *Greater Accuracy*

In the GISHOLT HYDRAULIC AUTOMATIC LATHE, feed pressures are applied directly to tools without intermediate cams, arms or other linkage. Accuracy is further insured by feeding against dead stops. In all cuts there is a moment of dwell during which cuts are cleaned up.

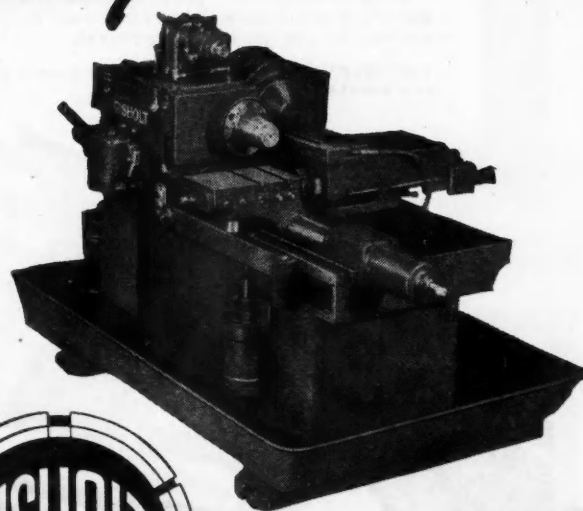
Front carriage is mounted on and driven by the massive bar to which it is clamped. Wide lateral support of carriage assures rigid alignment without tremor or tremor.

Movement of the massive rear slide is by hydraulic piston in the base of the slide itself.

Both carriages are directly supported by the massive integrally cast cabinet type bed and all bearing surfaces, ways and gibs are hardened and ground to assure permanent accuracy.

GISHOLT MACHINE COMPANY
1205 East Washington Avenue • Madison 3, Wisconsin

*Look Ahead... Keep Ahead... With
Gisholt Improvements in Metal Turning*

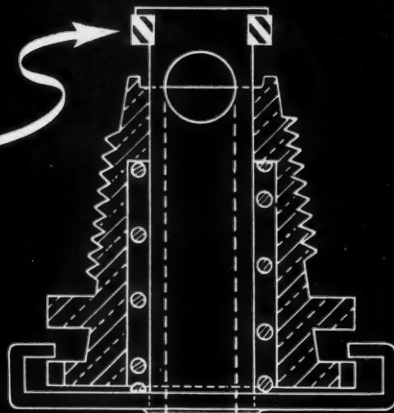


THE GISHOLT HYDRAULIC AUTOMATIC LATHE—
a genuinely rugged 12-inch lathe, also
suited for light, fast jobs. Handles chuck-
ing between centers or fixture-held work.

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

TURNET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

Synthetic Rubber Washer SEALS AROMATIC FUELS with light spring pressure



THE manufacturer of a push-type drain cock assembly for fuel systems was faced with a twofold sealing problem. He needed a washer that would (1) withstand aromatic fuel, and at the same time (2) provide a tight, lasting seal under light spring pressure.

He solved both problems with one of Armstrong's scientifically formulated synthetic rubber compounds. This material is highly resistant to aromatic fuels, oils, and most solvents. Its operating temperature range is minus 50° F. to plus 250° F. It can be assembled over a flange with ease, thanks to its excellent elasticity.

The answer to your particular sealing problem probably can be found in one of Armstrong's specialized sealing materials. Besides synthetic rubber compounds, these materials include cork compositions, cork-and-synthetic-rubber compositions, fiber sheet packings, and rag felt papers. For application data on these materials, send for your free copy of "Gaskets, Packings, and Seals." Address Armstrong Cork Company, Gaskets and Packings Department, 1510 Arch Street, Lancaster, Penna.

Engineering Service On Your Gasket Problems

No matter how difficult your sealing problem is, it will pay you to consult an Armstrong Gasket Engineer. He will give you expert, unbiased technical advice backed by Armstrong's 33 years of experience solving problems like the one described at the left. An Armstrong office is located conveniently near you. Call, write, or wire today. No obligation, of course.

MATERIALS AND SPECIALTIES FOR



AIRCRAFT AND AUTOMOTIVE UNITS

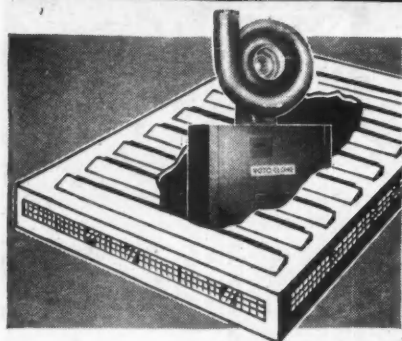
- Tank strap cushions
- Composition roll goods—with or without fabric back, plain or adhesive-coated—used as glazing strip, binding

- ing tape, cushion pads, and anti-skid flooring.
- Felts for vibration-damping and soundproofing

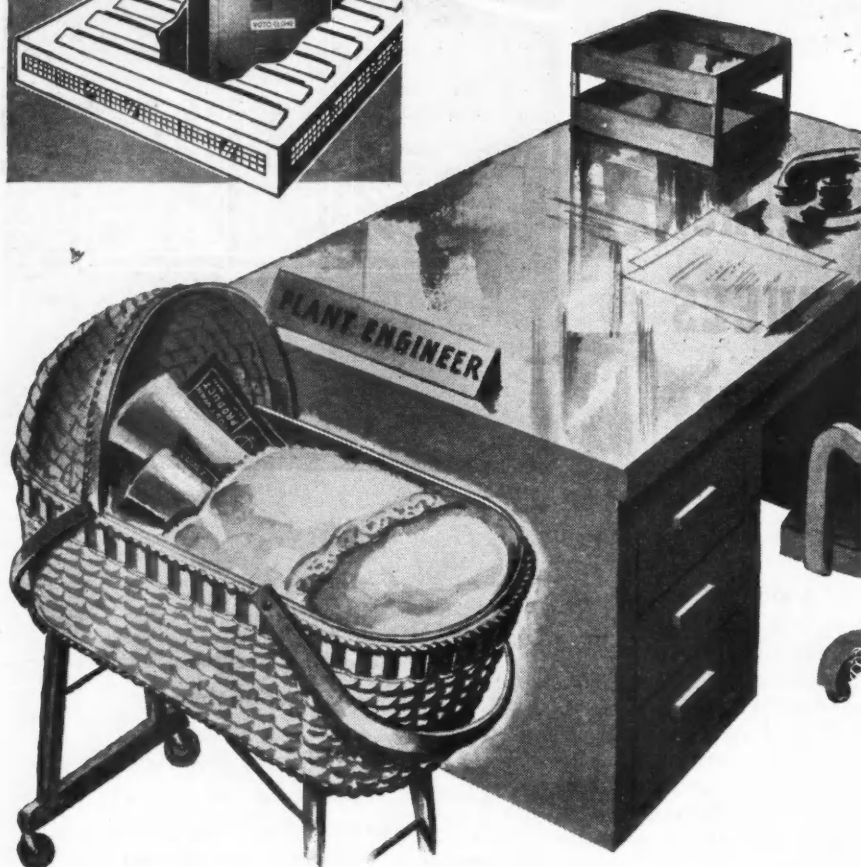
- Resilient floorings
- Carburetor floats and other fabricated natural or composition cork specialties

ARMSTRONG'S *Gaskets, Packings, and Seals*

Have you a "NEW BABY" to care for . . .



The Roto-Clone Dynamic Dust Precipitator is a compact dust control unit combining exhausters and dust collector.



Protect Your New Products with AAF Dust Control Equipment

No matter what you manufacture postwar, dust control will present a problem you will be faced with solving.

AAF's engineering department, in close cooperation with your consulting engineers, is ready now to blueprint a dust control system to meet your future requirements.

There's no obligation involved in requesting this service. Meanwhile, let us send you "AAF In Industry" which describes the complete line of AAF dust control and air filtration equipment.



AMERICAN AIR FILTER COMPANY, INC.
449 Central Avenue, Louisville 8, Kentucky
In Canada: Darling Bros., Ltd., Montreal, P. Q.

ROTO-CLONE DUST CONTROL EQUIPMENT

conceived the idea of a mechanical ejector, stated that it was used near the end of the war to unload gasoline, food and other vitally-needed supplies in areas inaccessible by land.

Engineers are studying the idea of adapting it to commercial planes for discharging mail and other cargo by parachute.

Airport Radio Station

A complete airport radio station ready to plug into a socket and start working is offered by Aireon Manufacturing Corp., Kansas City, Kan.

The corporation describes its new Type RS-1 50-watt radio station as a complete combination unit ready for installation—which means plugging it into a socket. The only exception is the antenna supporting poles which do not come with the equipment.

Push-buttons control the sets, which require no dialing or tuning as each channel is pre-tuned and controlled by radio crystals.

The station is designed for airports, airlines and other similar types of communications systems. It may be used from point to point or ground to plane communication or as a tower control station.

Borg-Warner to Make New Automatic Transmissions

The manufacturing facilities of Detroit Gear and other divisions of Borg-Warner Corp. will be immediately expanded for the manufacture of the new Detroit Gear automatic transmission. The program will require the acquisition of additional machinery and facilities in excess of \$12 million, but it will be a considerable time before the actual production can be started.

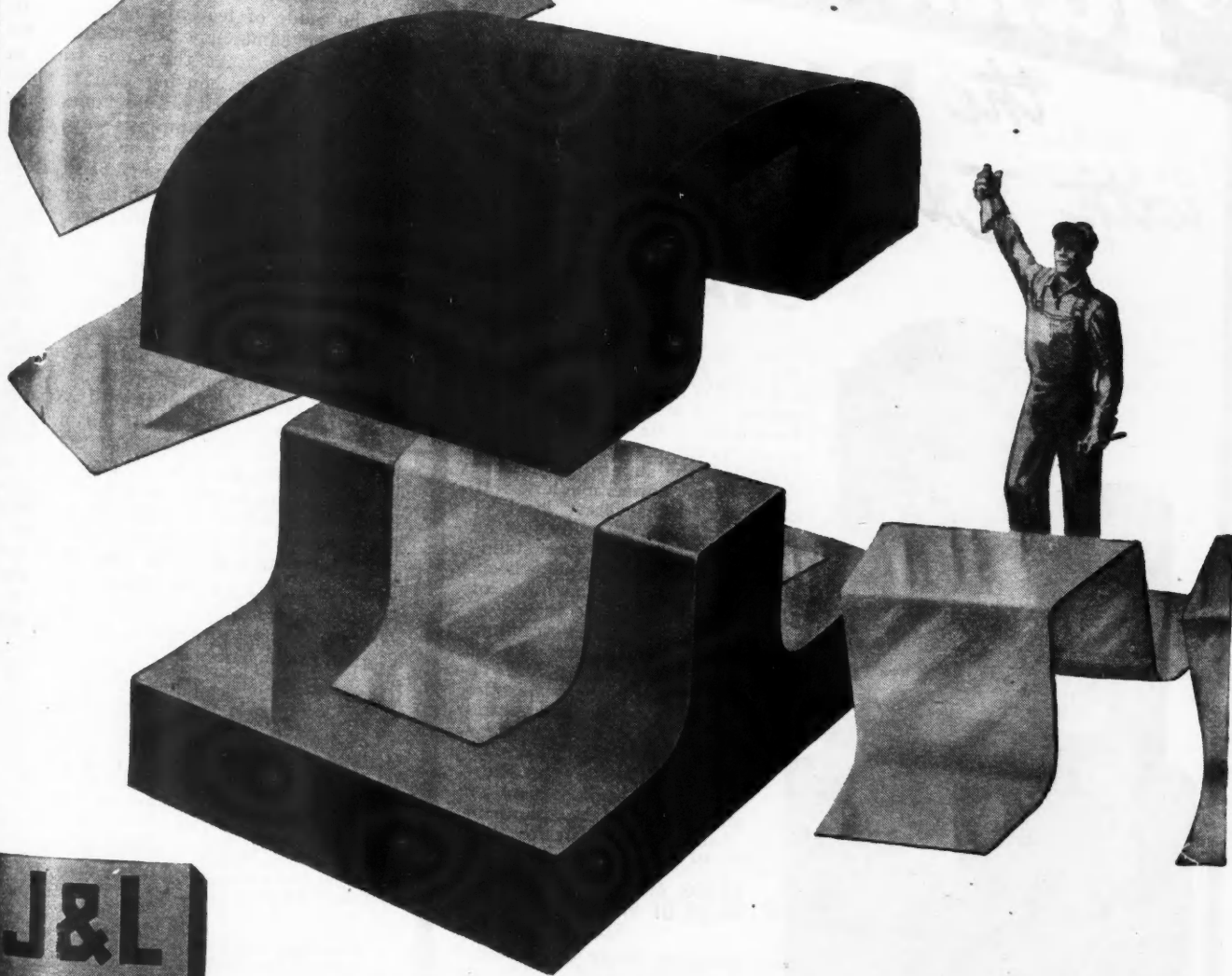
The new Detroit Gear transmission is a fully automatic transmission with four forward speeds and one reverse and considering the manner in which it relieves driving strain, is a surprisingly simple device. Because the engine is automatically kept in proper speed ratio to the driving wheels, and runs most of the time at relatively slow speeds, there is said to be a marked improvement in gasoline economy.

This automatic transmission provides four forward speeds and reverse with only 7 gears and is radically different from any such device heretofore available to the public. The shifting from low gear through the four speeds to high gear requires no manipulation nor attention from the driver and when going up steep hills or slowing down in traffic the downward shifts are likewise automatic. The shifts are quiet and almost imperceptible. When the car is brought to a full stop the motor is entirely disengaged.

The manufacturer states that very substantial contracts have already been made with automobile manufacturers.

OTISCOLOY

HIGH TENSILE STEEL SHEETS



**J&L
STEEL**

A high strength steel that is easily fabricated and readily welded. May be hot or cold formed. Affords reductions in weight . . . its greater strength permits use of lighter gauges. Resists corrosion. OtiscoLOY available in both sheets and plates for a wide variety of applications.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PENNSYLVANIA

October 15, 1945

When writing to advertisers please mention **AUTOMOTIVE and AVIATION INDUSTRIES**

New Buick Models

(Continued from page 19)

tail changes have been made: the differential case is one in. larger in diameter and has a heavier flange; the pinion spiral angle has been increased to 50 deg. In addition, the ring gear has a thicker back. The axle shaft is Tocco-hardened to strengthen it at the wheel end and to provide a hard-surface inner end for preventing end play.

The Saginaw ball bearing worm and nut steering gear remains unchanged except for the use of 9/32 in. balls instead of 1/4 in.

The radiator grille is new and is made of cold rolled steel stampings, the external surfaces of which are capped with chromium plated stainless steel. New front and rear reinforcements are used in the hood top. The depression for the ornament is revised, but will not affect interchangeability with the 1942 series. The radiator splash pans have been redesigned to permit the elimination of the front fender lower tie panel.

Many important changes and improvements in processing are incor-

porated in the bodies for 1946. For example, to prevent rusting of sheet metal the outer rocker panels have a series of louvers to provide ventilation. In addition, the rocker section is painted on the inside to prevent corrosion. The door panels are also painted on the inside to prevent corrosion. The door bottom weatherstrips are held down with closely spaced clip retainers to assure retention.

In keeping with the general principle of rust prevention, sill plates are changed from steel to aluminum; and other moldings are changed from steel to stainless steel or brass. Chrome plating specifications for steel and zinc die castings have been changed to GM Class A which has a thickness of 0.001 in. as compared with the former practice of only 0.00075 in. At the same time the specifications for zinc die castings have been changed to prewar standards, using four per cent aluminum.

A number of small parts which had to be made of lead-antimony when the shortage came, now are made of zinc die castings. At the same time, the C/V regulator housing and the gear support in the seat adjuster mechanism—formerly steel stampings—are of zinc die castings on the new models.

The windshield wiper body is installed ahead of the dash in the engine compartment, thus facilitating adjustment or replacement.

The heater equipment remains the same but the control system is changed. The fresh air valve controlling air to the heater and the thermostat are operated from separate buttons mounted below the instrument panel. The air control button is of push-pull type while the thermostat control button is of rotary type and connected directly to the thermostat valve. The three air valves—two on the dash for fresh air, and the one above the battery for heater air—have been improved in design to prevent air leakage in the closed position and to assure easy and positive action.

Buick has announced the following 1946 color combinations:

Body Color	Standard Wheel Color
*Carlsbad Black	Carlsbad Black
Nightshade Blue	Nightshade Blue
Canterbury Blue	Canterbury Blue
Verde Green	Verde Green
Sherwood Green	Sherwood Green
Brunswick Green	Brunswick Green
Royal Maroon	Royal Maroon
*Dusty Grey	Dusty Grey
*River Mist Grey	River Mist Grey
*River Mist Grey (U)	River Mist Grey
Dusty Grey (L)	
Brunswick Green (U)	Brunswick Green
Sherwood Green (L)	
*Lehigh Grey	Lehigh Grey
*Dante Red optional wheel color.	

Gar Wood Industries to Restyle Entire Line

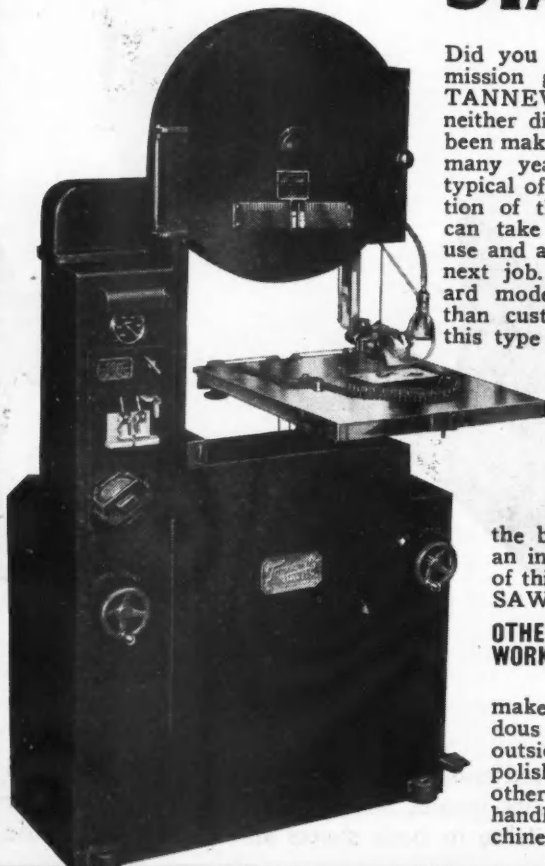
Gar Wood Industries, Inc., has retained Norman Bel Geddes, industrial designer, to restyle its entire varied line of products, it was announced by Glen A. Bassett, Gar Wood president.

Tannewitz

the DI-SAW

with Extra SPEED

AND EXTRA STAMINA



Did you ever hear of a transmission going haywire on a TANNEWITZ DI-SAW? No, neither did we, though we have been making die saws for a good many years. And that's just typical of the superior construction of the entire machine. It can take the severest kind of use and always be ready for the next job. Moreover the standard model has larger wheels than customary in machines of this type — a full 24 inches —

for greater traction, straighter, faster sawing and more production. Get the complete facts and you'll discover why TANNEWITZ DI-SAWS always show

the best possible return on an investment in equipment of this kind. Write for "DI-SAW" Bulletin.

OTHER MODELS TO HANDLE WORK OF PRACTICALLY ANY SIZE

make available the tremendous savings of inside and outside sawing, filing and polishing on dies, jigs and other work too large to handle on the standard machine. Bulletin on request.

THE TANNEWITZ WORKS
GRAND RAPIDS 4, MICHIGAN

How Orco can help You

ON PROBLEMS INVOLVING RUBBER AND SYNTHETIC RUBBER

DEVELOP NEW PARTS

Where component units of new products may require a combination of properties in a single material, ORCO can help you explore the possibilities of rubber and synthetic rubbers.

OBTAIN IMPROVED WEARING QUALITIES

If you seek improved resistance of rubber and synthetic rubber parts to conditions causing excessive wear, ORCO may help you by developing an improved compound.

CONTROL VIBRATION

Elimination or reduction of vibration, shock, and noise in moving parts of machinery involve problems on which ORCO is prepared to co-operate on every phase of vibration isolation.

DETERMINE BEST SYNTHETIC RUBBER FOR SPECIFIC NEEDS

ORCO offers you an impartial source of information regarding the comparative advantages of all commercially available synthetic rubbers as applied to any stated specifications.

CONDUCT LABORATORY AND FIELD TESTS

ORCO research activities comprise modern laboratory equipment and an experienced technical staff available for complete co-operation "from test tube to field test."

SOLVE PROBLEMS OF BONDING RUBBER TO OTHER MATERIALS

Adhesion processes for bonding rubber and synthetic rubbers to metals and a wide variety of other materials are highly specialized services available to you at The Ohio Rubber Company (ORCO).

DESIGN EFFICIENT MOLDS AND DIES

When required, ORCO offers complete service in the engineering of molds and dies to meet your specifications for mechanical molded or extruded rubber and synthetic rubber parts.

ENGINEER SPECIAL TOOLS AND EQUIPMENT

If your requirements call for special tools and equipment for efficient, large-scale production, ORCO maintains a specialized engineering service.

REDUCES COSTS THRU IMPROVED METHODS

Unusual "flexibility" of ORCO production facilities assures improved methods to minimize costs on both small or large volume requirements on either intermittent or continuous runs.

IN ONE WORD, WE OFFER YOU

"ORCO-OPERATION"

THE OHIO RUBBER COMPANY • WILLOUGHBY, OHIO

BRANCHES: DETROIT • NEW YORK • CHICAGO • INDIANAPOLIS • WASHINGTON • CLEVELAND

October 15, 1945

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

Cadillac Adds Improvements

(Continued from page 27)

Synthetic clutch piston seals similar to those used in wheel brake cylinders are effective in holding oil pressure with negligible leakage; hence, higher and more uniform line pressure is maintained even at high temperatures. Excessive over-speeding of the drums is prevented by automatic application of clutch plates. At high rotating speeds the clutch piston is actuated by the centrifugal effect of the oil trapped behind it. The resulting application of the clutch plates, in effect, acts as a brake

to retard the drum speed. Closer fitted seal rings with maximum gaps reduced from 0.010 to 0.006 in. maintain oil pressure and give more positive clutch action. Clearance with the outside diameter of the clutch drum has been increased 0.005 in. to eliminate scoring and sticking of rings.

Planet pinion pins have formed heads to hold them positively in place and to provide a locking means that can be easily inspected. The rear band width has been increased from 1 1/4 in. to 2

in. and the front band width has been increased from 7/8 in. to 1 in. Flat head rivets (in place of countersunk head) are used to hold the rear band anchor to the band. Removal of the countersunk hole in the band reduces the stress concentration at this point. The front band anchor has been increased in thickness from 1/4 in. to 5/32 in. This provides positive insurance against fatigue breakage plus increased durability in service.

The new intermediate shaft has increased cross-sectional area. Two 5/16 in. oil holes have been removed from the high stressed portion. The Woodruff keyways from the front unit clutch hub keys are eliminated, multiple shallow serrations being provided for this function.

Outstanding improvement in clutch durability is attained by use of high capacity clutch plates. Since the non-metallic clutch facings have greater friction and holding power when engaged, this permits the number of plates to be reduced from 10 to 8 in the rear unit and from 6 to 4 in the front unit. The smaller area of friction surfaces materially reduces drag when disengaged, particularly with cold oil; also permits softening of engagement. The facing material consists of concentric rings of cork composition and "Krafelt" (a Bakelite impregnated paper base) bonded to a steel plate with Bakelite binder under high pressure and temperature. Friction characteristics are stable for the life of the material which on accelerated tests is many times that of the best previous bronze plates.

The reverse mechanism has been entirely redesigned. Clashing is avoided by using a hydraulic blocker that momentarily retards completion of the shift until the reverse gear stops rotating. A new anchor reduces the percentage of cases wherein reverse teeth butt together. The rear gear set now consists of a single planetary unit of 2.63 to 1 reduction ratio, replacing the former double planetary unit of 2.26 to 1 ratio.

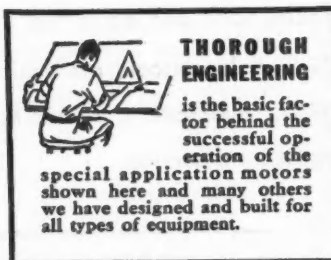
The manual shift control detent formerly located on the upper steering column is now inside the transmission where it is kept clean and well lubricated. The principal advantage, however, is more accurate positioning of the manual piston valve lands in relation to the oil port holes in the valve body. A new synthetic seal is more effective in preventing seepage of oil at the manual control shaft.

The speedometer drive gear, on the prewar transmission was a separate part fitted to the output shaft. It is now an integral part of the shaft. Fatigue strength of the output shaft is improved by increasing the shaft diameter from 1 1/4 to 1 1/2 diameter at the point where the shaft joins the planet pinion carrier flange, and by removal of the undercut in the shaft at this corner. The splines at the rear end, for the propeller shaft yoke, are made the same

(Turn to page 67, please)



A thoroughly dependable motor is the first step in meeting the high standards of performance that will be demanded of tomorrow's products. Backed by 30 years' experience and used successfully in over three thousand special applications, Lamb Electric motors may provide the answer to your motor problems.



THOROUGH ENGINEERING

is the basic factor behind the successful operation of the special application motors shown here and many others we have designed and built for all types of equipment.

THE LAMB ELECTRIC COMPANY • KENT, OHIO



as used on the 1942 synchromesh transmission shaft. The advantages gained are smoother running balance of the propeller shaft and complete interchangeability on synchromesh and Hydramatic cars.

Generally speaking, considerable attention has been given to improvement of rust and corrosion resistance in the body and accessories. All internal surfaces of body panels, doors and miscellaneous parts below the belt line are painted. As an extra precaution against rust in the rocker sill, ventilation louvers are added to dry out any moisture which may collect in this closure. The metal thickness in vulnerable spots is increased to reduce the possibility of rusting through. All joints where water or road salts would collect are sealed with a caulking compound. A great deal of rusting around the bottom of the doors, rocker sill, rear pillar and wheel housing panels in the prewar models can be attributed to drain holes in these compartments being plugged or collapsed. The drain hole slots on the 1946 models have spacers which insure the drain holes remaining open.

Because of material restrictions at the outbreak of the war, many moldings and other fittings on the 1942 models were changed to plain steel. All of these items are either stainless steel or plated die castings. The chrome plating of all the hardware on the body has been increased in thickness to resist corrosion. The window weatherstrip channels which were formerly plain steel have been changed to stainless steel. Items such as I.C.V. regulator mechanisms, seat adjuster mechanisms and outside door ferrules, where stampings were substituted in 1942, are now die castings.

New Amphenol Building to House All Plastic Operations

A new three story and basement building, which when completed, will house the expanding plastics manufacture of the American Phenolic Corp., Chicago, is rapidly nearing completion.

The new building, which abuts the main plant directly to the north, will be used exclusively for the production of plastic items both for the electronic grade and other industries. Completely new machinery for injection, extrusion, compression and fabrication of all types of plastics will be installed as soon as possible.

Mercury Aircraft Buys Penn Yan Buses, Inc.

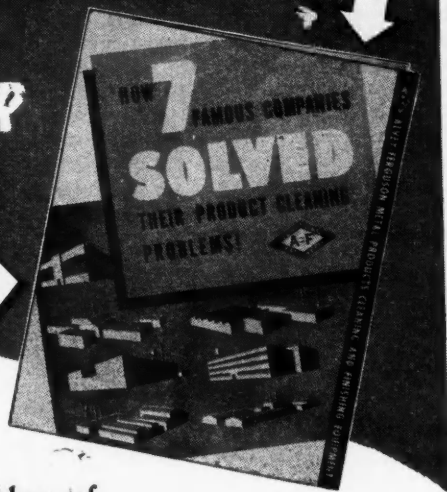
Mercury Aircraft, Inc., has purchased Penn Yan Buses, Inc., and will transfer that business from Penn Yan, N. Y., to the Mercury plants in Hammondsport, N. Y., where it will be expanded as a division of the Mercury Company.

7 SOLUTIONS

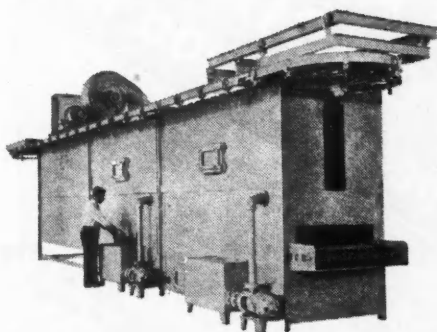
TO METAL PRODUCTS CLEANING PROBLEMS

*described in
this NEW FOLDER*

**WRITE for Your
Free Copy *TODAY!***



IF YOU have the problem of economically and efficiently cleaning and drying small tools or miscellaneous ball bearings or other metal parts or products . . . washing chromic acid off heavy chrome-plated parts . . . removing cyanide from hardened gears . . . removing chips from Diesel motor blocks—you will find many distinct innovations over previous methods in this new folder.



VALUABLE floor space is saved by this "Siamese-Twin" A-F Machine which combines two different complete wash, rinse and dry units in the same housing.

Write for your copy of this new folder, or without obligation, describe *your* particular metal products cleaning and finishing or indoor transportation problem and we will help you solve it.



The ALVEY-FERGUSON CO., 28 Disney St., Cincinnati 9, Ohio

Affiliated Corporation:

The Alvey-Ferguson Co. of Cal., P.O. Box 396 Vernon Branch, Los Angeles 11, Cal.

CONVEYING EQUIPMENT

Alvey-Ferguson

METAL PRODUCTS CLEANING & FINISHING EQUIPMENT

New Products

New Silicone Varnish

Dow Corning Corp., Midland, Mich., has developed a new heat-stable, waterproof varnish for impregnating electrical equipment—DC 996 silicone varnish. An advantage of this varnish is that electrical equipment can be baked fully assembled without damaging the

commutators or the slip rings. The 300-deg temperature required to cure DC 996 does not affect shellac-bonded mica or core plating.

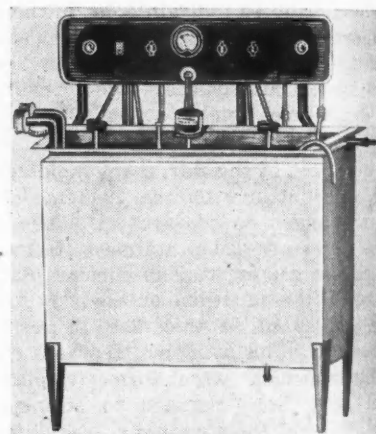
Electrical equipment wound with silicone insulating materials and sealed by impregnating with DC 996 will have the high order of thermal stability and

the retention of waterproofness characteristic of silicone insulation. DC 996 can be cured at temperatures obtainable in ovens now used for curing organic varnishes.

Constant Temperature and Plastic Melting Tank

Laboratory Specialties, Inc., Wabash, Ind., has placed on the market a constant temperature and plastic melting tank for laboratory and industrial use. It may be used for melting plastic materials such as are used for coating of metal parts before shipment. In the research laboratory it may be used to provide a constant temperature, water, oil or Prestone bath, or for maintaining the temperature of plating or metal treating solutions to any specified degree between the temperature of the cooling liquid and 400 F.

It is constructed of a welded steel



Constant temperature and plastic melting tank made by Laboratory Specialties, Inc.

tank, which is surrounded by transite insulating material. The tank is provided with immersion type heating elements of 2000 watts capacity, an electric stirrer, cooling coils and dual temperature controls.

For application where a steel tank would not be suitable, the same fundamental design is available on special order in stainless steel, copper, or other materials. The unit can be supplied with heating elements mounted underneath the tank if the use is such that the steel clad immersion elements cannot be used.

New Goodrich Synthetic Tire

The B. F. Goodrich Co. has released details on a newly-designed passenger car tire. The fundamental advance achieved in the new all-synthetic Silvertown tire is a tread which is wider and rolls more squarely and flatly along the pavement. This is made possible through considerably greater carcass strength built into the tire by using a new and stronger cotton cord, and increasing the number of cords per inch in the plies.

(Turn to page 70, please)

HERBRAND
DROP FORGINGS
--any size or shape up to 200 lbs.

THE HERBRAND CORPORATION • Fremont, Ohio
Drop-Forged Tools Since 1881

SIRVIS

Mechanical Leather—precision made from Tannery to Finished Product.

Packings—U, V, Flanged and Cup

Protective Boots

Washers • Gaskets

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Special formed leather parts

Ready Now!

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Special Molded Parts

"Perfect" Oil Seals for Automotive Vehicles—
Wheels, Axle Shafts, Transmission Shafts, Pinion
Bearings, Shock Absorbers, Fan and Pump Shafts,
Steering Mechanisms, and wherever protection
is required against fluid leakage or the entrance
of foreign matter.

CHICAGO RAWHIDE MANUFACTURING COMPANY

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*44 years manufacturing quality mechanical leather goods exclusively
and now Sirvene Synthetic Products.*

Philadelphia • Cleveland • New York • Detroit • Boston • Pittsburgh • Cincinnati

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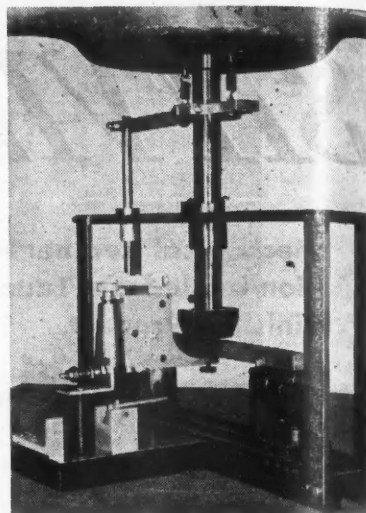
In addition to the markedly different design of the new tire, in both tread and carcass, it is made with GR-S 10 synthetic rubber developed by B. F. Goodrich engineers.

Combination Flexure Tool and Deflectometer

In completing its present line of equipment for testing the many different molded plastics, plastic laminates and woods, the Southwark Division of the Baldwin Locomotive Works has added a combination flexure tool and

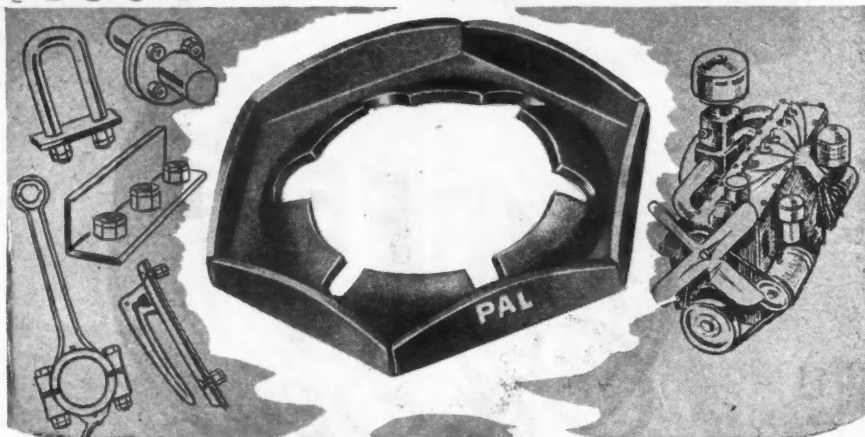
deflectometer for testing those materials. The new instrument will make tests in bending in accordance with the latest federal specifications and those of the A.S.T.M., and will fit any testing machine.

The deflectometer measures the deflection from the center of the specimen and conveys this to an autographic stress-strain recorder which gives the load deflection curve. One of the features of this instrument permits the operator to adjust the magnification of the deflection in multiples of 5, 10, 20, 50, 100 and 200 times. The high magnification ratio is used for very stiff and



Testing device made by Southwark Division of the Baldwin Locomotive Works

TOUGH SPOTS OR HOT SPOTS



PALNUTS HOLD TIGHT!

**RESIST SEVEREST VIBRATION—
WITHSTAND HIGH TEMPERATURES**

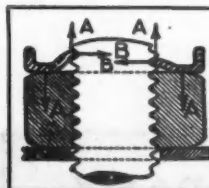
You can use Double-locking PALNUTS with security *wherever* assemblies must stay tight, whether structural parts or engine parts. Made of spring tempered steel, PALNUTS are unaffected by load, vibration, heat or oil.

PALNUTS apply quickly on top of regular nuts, holding them to original tightness. The regular nut does the load-carrying—the PALNUT keeps it tight. PALNUTS require only 3 bolt threads

space, provide great holding power with little bulk or weight. Extremely low in cost, may be re-used, are interchangeable with other approved locking devices. Used for over 15 years on aircraft, automotive and mechanical equipment of all kinds. Send details of assembly for samples. Write for Palnut Manual No. 1 giving full engineering data.

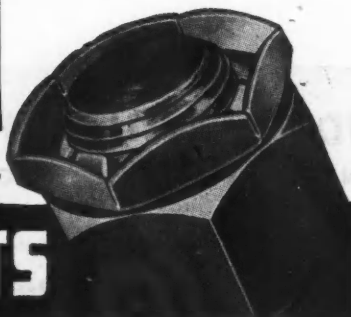
TYPICAL AUTOMOTIVE USES

Connecting Rods • Main Bearings • Engine Mounting • Radiator Mounting • Body Hold Down • Shock Absorber Mounting • Sway Bar Mounting • Hand Brake Applications • Body Hardware and Accessories



DOUBLE LOCKING ACTION

When the PALNUT is tightened its arched, slotted jaws grip the bolt like a chuck (B-B), while spring tension is exerted upward on the bolt thread and downward on the regular nut (A-A), securely locking both.



The Palnut Co., 60 Cordier St., Irvington 11, N.J.

DOUBLE-
LOCKING

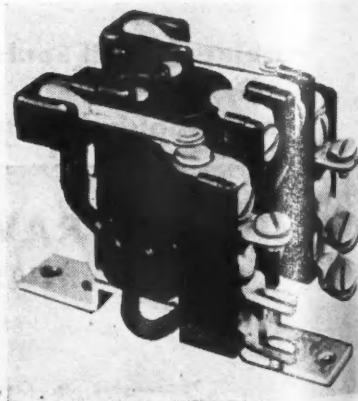
PALNUTS

Improved Line of Magnetic Relays

R-B-M Manufacturing Co. (Division of Essex Wire Corp.), Logansport Ind., offers a new and improved line of single- and two-pole a-c and d-c magnetic relays for industrial and electronic application.

Contact arrangements are single and double pole—normally open, normally

(Turn to page 72, please)



R-B-M magnetic relay



AUTOMOTIVE car and truck manufacturing and sales plans find an asset in the "READY" position of Hayes Industries' engineering and manufacturing. Built on years of pre-war development and pioneering of improvements in its fields—and with aircraft and military vehicles by the hundreds of thousands supplied without delay—we are now **READY** and tooled to supply progressive peacetime requirements.

Our new Sound and Wind Tunnel Laboratory, only other one of its kind in the U. S., means new research benefits for the automotive industry.

**HAYES
INDUSTRIES** INC.

JACKSON, MICHIGAN

FANS • MUFFLERS • MOLDINGS • OTHER PARTS



Products being treated in EF Chain Belt Furnaces, include:

Sprockets
Cap screws
Bolts and nuts
Gears and pinions
Flat springs
Coil springs
Small forgings
Valve springs
Spring plates
Tractor links
Rivets and washers
Wrench & tool parts
Bearing parts
—cups and cones
Machine gun
cartridge clips
Aircraft engine parts
Automotive parts
Rock bits, and many
other products

For Hardening Small Parts

175 to 2000 lbs. per hour

Uniformly — Scale-Free — Continuously

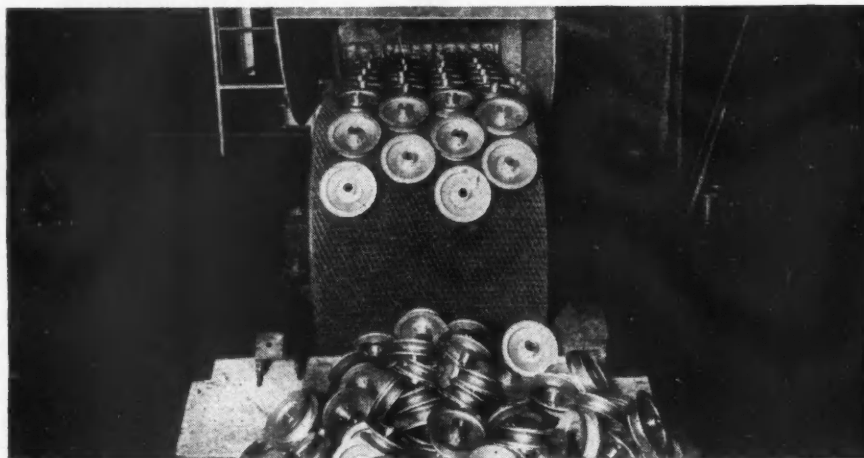
The above gas fired radiant tube chain belt furnace is one of three we installed in one plant. Hundreds are in operation handling products such as listed at left. We build them for gas, oil or electrically heated.

The EF chain belt conveyor type furnace is one of the most satisfactory general purpose furnaces built for the continuous, uniform, economical production heat treatment of small and medium size products. We will be glad to send complete data on these and other types we build.

Send for circulars showing the chain belt and other types of EF production furnaces

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces—For Any Process, Product or Production



The Completed Assemblies are Discharged Securely Joined, Bright, Continuously

Aluminum, brass or steel products ranging in size from small intricate assemblies weighing a fraction of an ounce up to large assemblies weighing several pounds are being neatly and securely joined in EF continuous and batch type brazing and soldering furnaces.

Send for printed matter showing various types of EF brazing furnaces.

Strong, leak-proof joints are made and the completed units are discharged from the furnace—clean and bright. Any number of joints in the same product or any number of pieces can be joined at one time.

Investigate EF Furnaces for Joining Your Aluminum, Brass, Copper or Steel Parts.

The Electric Furnace Co., Salem, Ohio

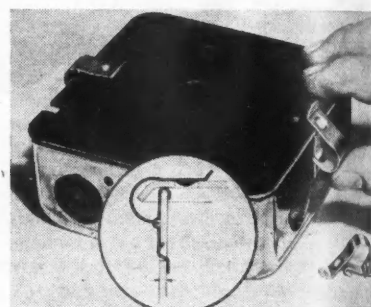
Gas Fired, Oil Fired and Electric Furnaces—For Any Process, Product or Production

closed, and double throw. Silver contacts are used. Ratings are: 10 amp at 24 volts direct current and 110 volts alternating current, 5 amp at 220 volts alternating current; one hp single phase 110 and 220 volts alternating current.

Armatures are self-aligning. All wiring terminals, either screw or soldered, are easily accessible from the front. Single- and two-pole a-c and d-c relays have identical bases for complete interchangeability in mounting. Relays may be mounted either from front or rear.

New Box Cover Fastener

A spring steel fastener for box covers that eliminates all screws, nuts and rivets, as well as tools for attaching has been originated by Tinnerman Products, Inc., Cleveland, Ohio. The clip is self-retained and is snapped by hand into pre-punched holes in the sides of the box. By flipping the clip



Tinnerman box cover fastener

into locked position, the cover is held firmly in place as shown in the illustration. To remove the cover, the clips are unsnapped by pushing them back with the thumb. These new clips are entirely outside of the box with nothing inside to obstruct or damage wires or other equipment. They are available for use on sheet metal, die cast, plastic or plywood boxes of varying wall thicknesses.

Wetting Agent for X-Ray Developer

A double-purpose wetner has been added to the Supermix line of X-ray film developing materials by General Electric X-Ray Corp., Chicago, Ill. One purpose of the solution is to act as a wetting agent for X-ray developer and refresher, the other as an anti-spotting, quick-drying rinse.

As a wetting agent, 2 cc of the wetner added to each gallon of developer and refresher is said to produce more even development, less likelihood of streaking, better developer and film contact, less chance for air bell and pinhole formation, elimination of dichroic fog—completely blank spots resulting from adhesion, greater developer clarity, cleaner films and extended developer life.

As a final rinse, 4 cc of the wetner (Turn to page 74, please)

"HEATRONIC MOLDING

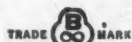
MADE THIS JOB

PRACTICAL"

THESE HEAVY-DUTY electrical connecting plugs, molded from BAKELITE plastics, are used on every type of U. S. combat vessel. They are unusual because of their exceptional wall thicknesses and density—conclusive evidence that pre-war limitations on the size, shape, and design of BAKELITE plastic insulating parts no longer exist. They were produced by Heatronic molding—announced by Bakelite Corporation in 1943—which has vastly increased the moldability of all types of phenolic molding plastic, including those with a high bulk factor.

In Heatronic molding, the heat is uniformly generated *within* the molding material charge by high-frequency current. By the addition of high-frequency preheating units to standard compression- and transfer-molding equipment, parts are now readily molded that formerly involved long and expensive molding cycles. Heatronic molding shortens curing time by one-tenth to one-half, often reduces molding pressures by 30 to 40 per cent, and permits larger moldings on present presses. It also causes less wear on molds, minimizes shearing and displacement of inserts, and permits greater production per mold cavity.

The extremely valuable Heatronic molding experience gained during the war is now available to engineers and designers through the facilities of the Bakelite Engineering Staff. Write Department 17 for detailed information about the advantages of this outstanding development. Also, write for Booklet G-8, "A Simplified Guide to BAKELITE and VINYLITE Plastics."



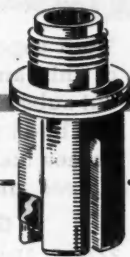
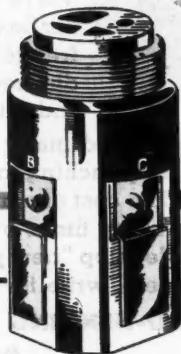
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Unit of

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BAKELITE MOLDING PLASTICS

TRADE-MARK

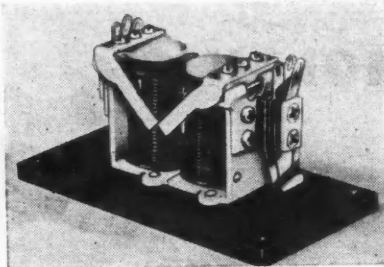
October 15, 1945

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added to each gallon of ordinary tap water, permits uniform surface water drainage, cuts drying time about 40 per cent, increases dryer capacity, expedites film examination, prevents water-spotted films, and assures greater scratch resistance, according to the maker.

Newly Designed Latching Relays

Latching Aerotrols are small latching relays designed and made by Cook Electric Co., Chicago, Ill. They are made by combining two of Cook's standard line of Aerotrol "400" series



Latching Aerotrol

relays, with an interlocking armature. This design makes it possible to com-

bine any two Aerotrols of similar or different types into a latching relay. They can be supplied in either single or double pile-ups and with all standard spring pile-up formations and combinations. Mounting arrangements are designed to specification. Latching Aerotrols can be supplied for either a-c or d-c operation with maximum voltage of 125 volts direct current or 120 volts, 60 cycle alternating current. Dimensions of this latching Aerotrol are—height, 19/16 in.; length, 2 7/8 in., and width, 15/16 in.

Tungsten Carbide Thread Plug Gages

A complete range of tungsten carbide thread plug gages, both standard and special, is announced by the Sheffield Corp., Dayton, Ohio. All the popular standard sizes are carried in stock while other standard sizes are available for quick delivery. Service is also given on semi-standard and special gages.

Tungsten carbide thread plug gages are normally used on high production and close tolerance jobs. Their wear-life is many times that of any specially treated or chrome-plated steel gage when handled with proper care.

Improved Gearless Pump

An improved gearless pump for water, light oil or other liquid circulating use has been introduced by Eco Engineering Co., Newark, N. J.

The new pump is equipped with special bearings which require only water lubrication, eliminating the need for grease cups. No adjustments are needed. All metal is of bronze. The pump can be used in oil, or fresh or salt water. It can be mounted at any angle and operated in either direction with equal efficiency. Opening of face plate allows quick removal of any obstructing material.

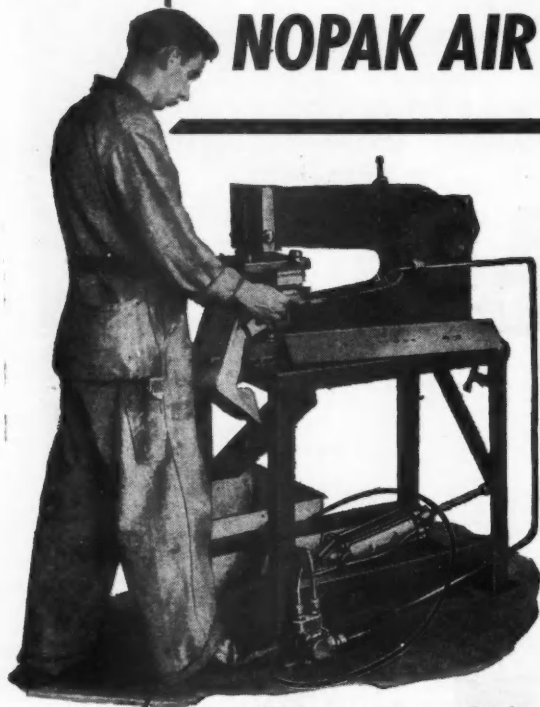
The impeller, which is a removable unit, is of tough resilient material composed of several layers of laminated sections, vulcanized together under

(Turn to page 76, please)



Eco gearless pump

KICK PRESS DEVELOPS "9-to-1 PUNCH" Powered by NOPAK AIR CYLINDER



When this efficient kick press was operated by foot power, it was possible to punch only 1 or 2 holes at a time in 20 gauge sheet steel. Punching dies of limited capacity had to be used. NOW . . . with a Model E NOPAK Air Cylinder in place of foot power . . . it is possible to use gang dies of 9-hole capacity, or more.

A NOPAK Foot Control Valve actuates the cylinder, leaves operator's hands free to feed sheets into the die, reduces manual effort and fatigue to a minimum.

With capacity multiplied many times, the unit cost of this and similar punching operations has been cut substantially. The cost of conversion to air power has been paid for many times over. If you have machines that could develop "new punch" with NOPAK Valves and Cylinders, write for further information.

GALLAND-HENNING MFG. CO.

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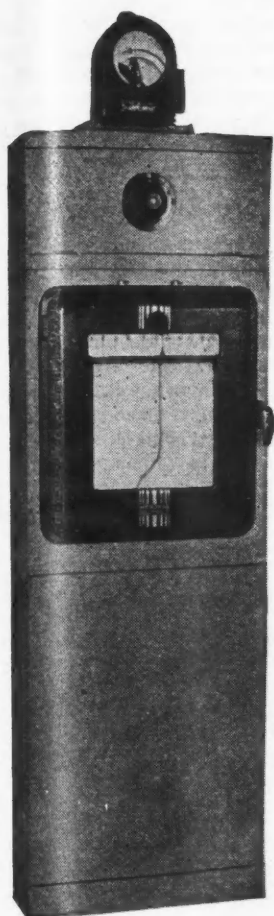
NOPAK

VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE

A 4870-1/2 I-A

A Model E NOPAK Cylinder (pendulum mounting) of 3" diameter and 7" stroke was used to power this kick press. A Model R Foot Valve controls it.





Micromax Controller at left regulates the heating of knife blade forgings in the electric lead pot hardening furnace at Western States Cutlery Company, Boulder, Colo.

"MICROMAX Gives Dependable Heat-treats" says Maker of Combat Knives

"We were working 100% on production of knives for the Armed Forces," says Western States Cutlery.

"We use a special formula, high carbon cutlery steel for the blades which range from 3 to 15 inches long, 1/2 to 2 inches wide. The blades are hardened in batches in an electrically-heated lead pot furnace. They are manually racked and held in tongs for immersion.

"A Micromax Controller is used to control temperature in the lead pot. Replacing a millivoltmeter formerly used, this instrument gives a record of blade immersions through-

out operating periods, and by its accuracy shows the quality of our heating control and hardening. *It assures us of dependable heat-treating jobs,* and we are profiting a great deal by having it."

A standard Micromax is adaptable to any furnace; can provide the on-off regulation or proportioning control.

Catalog N-33A, "Micromax Thermocouple Pyrometers", gives general information about all Micromax Controllers. An L&N engineer will be glad to supply more individualized information, if you will outline your problem.



LEEDS & NORTHRUP COMPANY, 4966 STENTON AVE., PHILA., PA.

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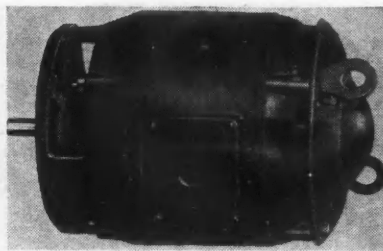
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75

pressure. It enables sandy, muddy, or gritty particles to pass without harm to the pump should they get in the water or oil system.

Protected-Type A-C Motors

The Crocker-Wheeler Division of Joshua Hendy Iron Works, Ampere, N. J., announces a new addition to the company's line of protected-type a-c motors. The newcomer, a vertical drip-proof motor which is rated at 40 C rise continuous duty with a 15 per cent service factor, is designed for operation from 60 or 50 cycle, 3 or 2 phase circuits at all standard voltages. At pres-



Crocker-Wheeler motor

ent a NEMA "B" flange type mounting up to and including the "284" frame, and a NEMA "C" face type mounting

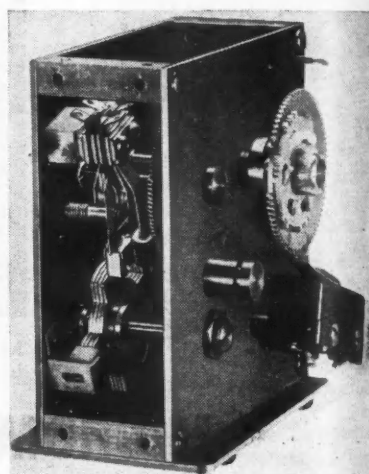
up to and including the "326" frame are available.

All ventilating openings of this new line of motors are shielded against the entrance of dripping liquids and falling particles. Oversize ball bearings are provided to carry thrust in addition to the rotor.

Constant-Speed, D-C Motor

A small constant-speed, d-c motor has been brought out by the Amglo Corp., Chicago, Ill. The new motor is said to be adaptable to synchronous operation formerly possible only through the use of alternating current. It is self-starting and attains full speed almost instantly. Current consumption is from .06 to 1 watt. Shaft speeds may be geared from 1 revolution each 24 hr to 600 rpm.

The Amglo constant-speed d-c motor



Amglo constant-speed motor

is available for use at 1½, 3, 6, 12, 24, 32, or 110 volts. Constant speed is said to be maintained even in the case of storage battery operation where the voltage is higher when the battery is being charged.

Southwark Ram Pacer

In testing metals, plastics and woods, many specifications require that the loads be applied at certain and exact speeds. To fill the need for a simple, fully automatic speed control device for this purpose, the Southwark Division of the Baldwin Locomotive Works has just completed the Southwark Ram Pacer.

The new device, which attaches to a standard hydraulic testing machine, gives control over the crosshead movement at eight present speeds, .01, .02, .05, 0.1, 0.2, 0.4, 0.5 and 1.0 in. per min. These speeds are obtained by gear changes on the synchronous motor drive unit. This unit is attached to the fixed frame of the machine while the dial portion of the apparatus is attached to the moving crosshead. The pointer sprocket wheel and the sprocket

(Turn to page 78, please)

**FULL-WEB TYPE FOR
GREATER STRENGTH**

**A
NEW
CAST
STEEL WHEEL**

BY GUNITE

Gunite Foundries offers new and greater service to manufacturers of heavy automotive equipment by an expansion of facilities to produce the new and improved type CAST STEEL WHEEL shown above. Carefully engineered and manufactured by the makers of famous GUNITE Brake Drums, they are delivered to you as complete wheels, ready to mount on your axles. *Write today for further information.*



GUNITE CASTINGS...FOR TRUCKS, TRACTORS, TRAILERS, and BUSES



*Almost every American
benefits every day
from the products of
BORG-WARNER*

GEARING FOR PEACE as painted by James Sessions at Warner Gear in Muncie, Indiana. From the inception of the first "horseless carriage," this great Borg-Warner plant has consistently been the leader in the mass production of gear assemblies for the automotive industry. During the war, it was one of the largest producers of transmissions for all types of motorized military vehicles.

The Warner Gear Division, although the world's largest independent producer of transmissions, is only one of three great Borg-Warner units making gear assemblies.

There are many fields in which Borg-Warner products benefit almost every American every day. In fact, Borg-Warner products are found on 9 out of 10 farms, in

9 out of 10 airplanes as well as in 9 out of 10 makes of automobiles. And Norge refrigerators, ranges and washing machines make the homes of millions more efficient and livable.

All of which illustrates how Borg-Warner's principle, "Design it better, make it better" works in many ways to bring you ever better products at ever lower costs.

Partners with the automotive and aviation industries from the start, Borg-Warner parts today are serving in 9 out of 10 planes and makes of automobiles.



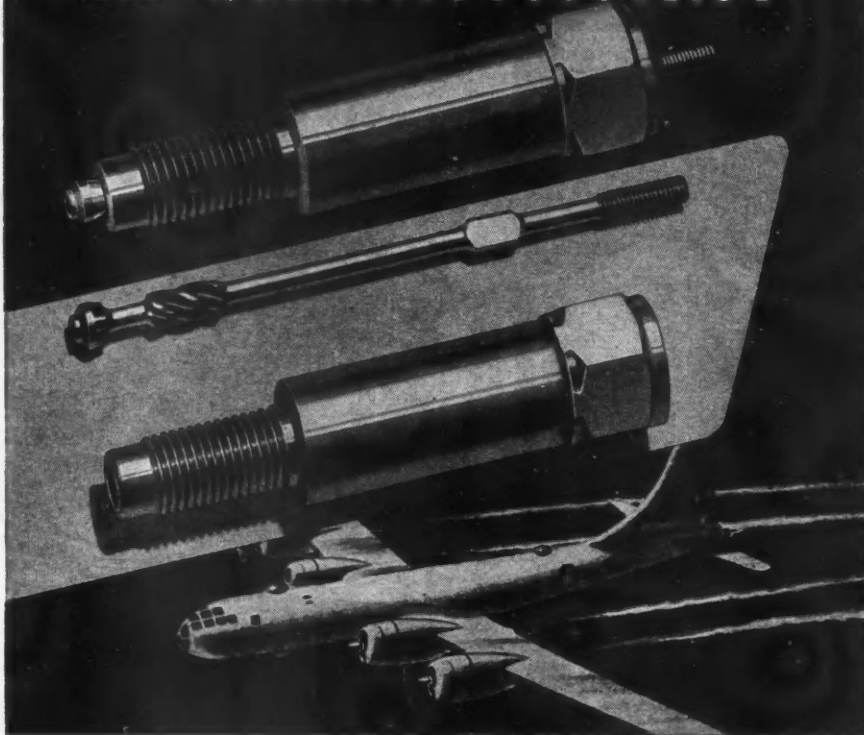
CLUTCHES AND CLUTCH PARTS • GEARS
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Makers of essential operating parts for the automotive, aviation, marine and farm implement industries, and of Norge home appliances . . . these units form Borg-Warner: BORG & BECK • BORG-WARNER INTERNATIONAL • BORG WARNER SERVICE PARTS • B-W SUPERCHARGERS, INC. • CALUMET STEEL • DETROIT GEAR • DETROIT VAPOR STOVE • INGERSOLL STEEL & DISC • LONG MANUFACTURING • MARBON • MARVEL-SCHLEBLER CARBURETOR • MECHANICS UNIVERSAL JOINT • MORSE CHAIN • NORGE • NORGE MACHINE PRODUCTS • PESCO PRODUCTS • ROCKFORD CLUTCH • SPRING DIVISION • WARNER AUTOMOTIVE PARTS • WARNER GEAR

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These B-29 fuel injector parts are a good example of Western's ability to produce truly precision work on a production basis. Valve body and needle are made of AMS-5610 stainless steel, must be ultra-smooth to defeat corrosion. Diameter of the valve body hole is held to .0005 for its entire length, permitted variation of concentricity between hole and seat may not exceed .0005 total indicator reading. Equally accurate concentricity must be maintained between the triangular section and valve seat on the needle, a difficult job because of its diameter and length. Your requirements may not demand this aircraft-products precision, but the same skill and experience go into parts made to commercial standards, so you'll find satisfaction in Western service—send your inquiries today.

Western service is complete, with capacity for turning bar stock ranging in diameter from wire size up to 4 1/8" round, plus . . . all the equipment necessary for performing secondary and finishing operations including precision grinding, heat-treating and penetrating.

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wheel on the drive unit are connected by an endless weighted chain. With the gear selected for a certain speed the hydraulic valve of the testing machine is opened until the loading head rises to a point where the dial pointer stands still. This means that the pointer sprocket and the motor driven sprocket below are moving at exactly the same speed. They counteract each other.

The Southwark Ram Pacer actually is a combination tool since it also can be used as a deflectometer. The dial is divided into 200 graduations of .001 in. each, and if the synchronous motor is not turned on, the dial will indicate the deflection of a specimen under test.

Wire-Corded Tire

A wire-corded, heavy-duty tire what is said to be practically blowout proof, is now in the final experimental stage at the Firestone Tire and Rubber Co. Fine metal wire cord with a very high tensile strength is bonded with rubber



Firestone wire-corded tire

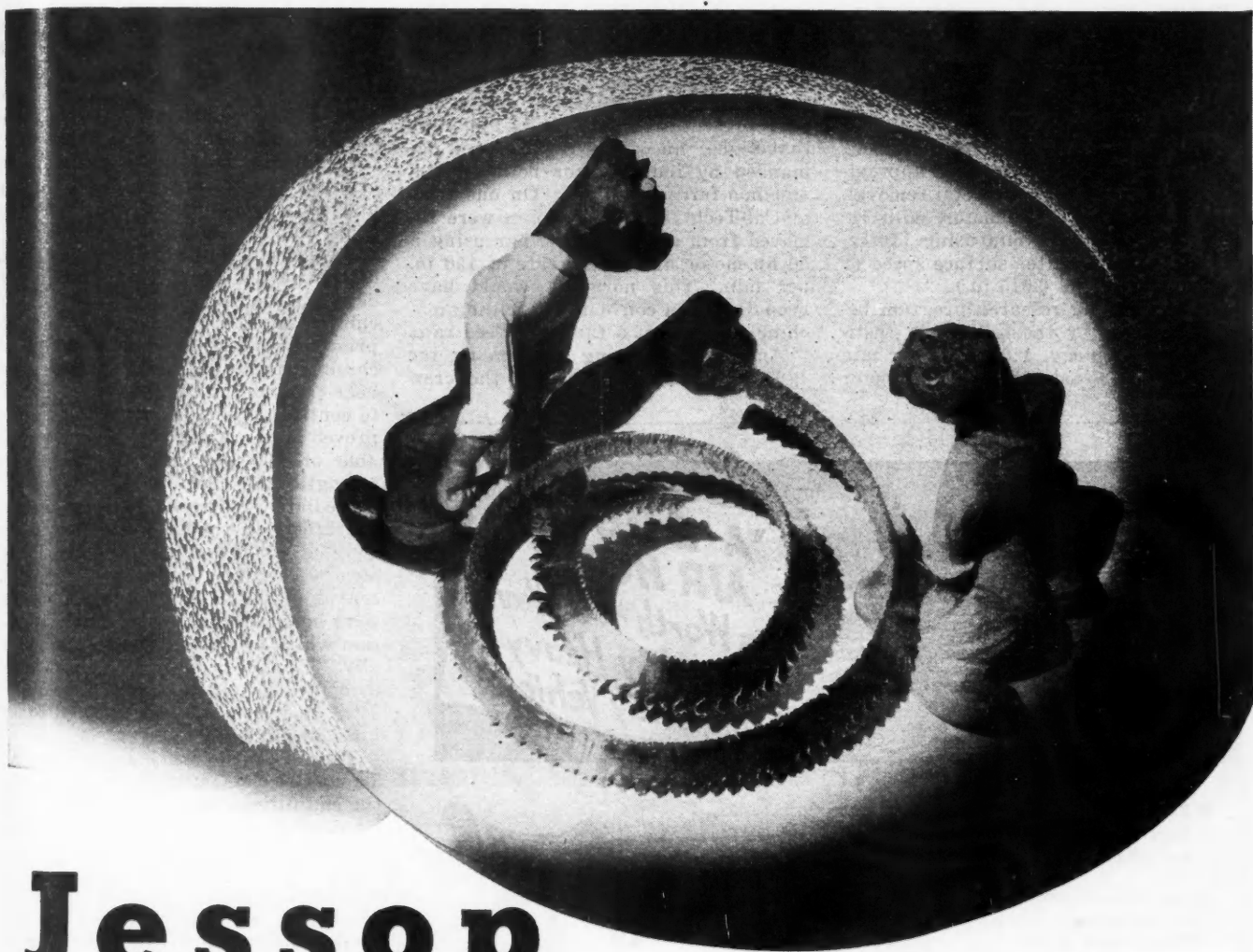
to provide the foundation of the new tire. Every cord in every ply is five times as strong as the strongest cord heretofore used in conventional tires. Because of the strength of the metal, fewer plies are required, and the walls of the tire consequently are thinner. This contributes toward cooler running.

The safety secret of the tire lies in the strong but thin construction and the heat-conducting nature of the wire cords. Heat is carried away from the hot spots within the tire and dissipated by the metal.

Dual-Purpose Angle Dresser

The Bemis angle dresser, a device for dressing precise angles on surface grinder wheels, is now in production at Nichols-Morris Corp., New York, N. Y. The diamond dressing tool is mounted on an adjustable sine-angle plate which locates on the magnetic chuck directly below the grinding wheel. Two-inch micrometers are the only measuring in-

(Turn to page 122, please)



Jessop

- FOR TURNING OFF CHIPS THAT WEIGH POUNDS
- FOR LIGHTER WORK WHERE CHIPS ARE FLUFF

MUSTANG M-2 HIGH SPEED TOOL STEEL

"I stood by a lathe in a railway shop where Jessop Mustang M-2 was being used. This is what I saw: *

"Tools were being used for turning simultaneously two locomotive tires 60" in diameter. Both tires were completed in two cuts, removing $\frac{1}{8}$ " to $\frac{3}{8}$ " of metal at each cut, at approximately 30 feet per minute. Operator remarked that average tools required regrinding every two cuts, but Mustang M-2 made five cuts, completing the two tires, and still were not in need of regrinding."

Mustang M-2 is just as efficient on the lighter work in average shop practice as on the extremely heavy work that produced the chip illustrated. Evidence of this is seen in the fact that a majority of automobile manufacturers have standardized on this analysis and find it most suitable for 70% of their high speed tool steel requirements.

Write for complete information.

*Report from Jessop Field Engineer.

JESSOP STEEL COMPANY

HEAD OFFICE AND WORKS WASHINGTON,

Penna.



Established 1901

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Northrop P-61 Production

(Continued from page 24)

of metal from the largest cap in a floor to floor time already mentioned of about 55 min. While this averages approximately 45 cu in. per min metal removal, on some cuts with one motor, mills remove 194 cu in. per min using 116 in. feed rate and a cutter surface speed of 7000 ft (chip load 0.015 in.).

At the milling research program being conducted by the California Institute of Technology, 420 cu in. per min have been removed with a 100 hp motor

on representative cuts. It is apparent that higher hp will be required and demanded by industry for both ferrous and non-ferrous milling. On one trial at Cal-Tech 75 cu in. per min were removed from annealed 4130 bar using a 50 hp motor and a feed rate of 150 in. per min. This normally would have been done on a conventional milling machine of 15 hp at a far lower feed rate.

Another interesting problem on the P-61 is the manufacture of the crew

nacelle spar caps. While these members are not spar caps in the technical sense, they tie the wings together through the fuselage or crew nacelle. These members, which are about 4.0 ft long, were designed using round steel tubing with a forged fitting welded into each end. The original design involved arc welding, and as a consequence, the forged fittings and the tubing were designed to make fishtail joints to insure strength of the welded joint. This was a costly design since it involved accurate machining of the forging and the tube prior to welding, as well as finish machining after. Also weld shrinkage and heat treatment distortion were difficult to control. When flash welding was approved by the Army for a design allowable of 100 per cent of base metal strength, the crew nacelle caps were immediately redesigned for flash welding operation. In the new design the spar tubes of 4.5 in. OD by 0.31 in. wall 4140 steel were cut to length to a linear tolerance of 0.020 in. The end forgings were bored and turned to a tubular section which matched the tube dimensionally. The end forgings were rough machined for clevis faces and the clevis attach bolt hole was rough bored to 0.25 in. under finished size.

The flash weld machine, a 400 KVA Taylor-Winfield, was tooled up so that the end fittings were located in position by pins to insure parallelism. Clamping jaws were devised which gripped both the end fitting and the tube, and held them in proper relation so that the pins could be removed prior to the flash welding operation. If the pins were left in, spring-back in the machine caused binding of the pins. The cross section area of the flash weld was 4.11 sq in. which is about the peak capacity of the 400 KVA machine.

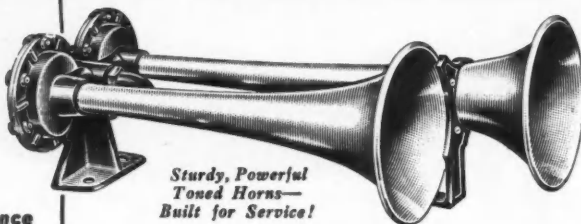
It was found that by post-heating the weld after the original flash weld was complete, very uniform welds were obtained. Many of the spars were pulled in tension to destruction, and all failures occurred in the base material of the tubing and not in the weld. Some idea of the value of this method for high loaded structures can be visualized from the following figures. The ultimate tensile strength of the spar cap described is 657,000 lb. Representative spars from each group run were proof loaded to 90 per cent of design load or 404,000 lb. The record of weld failures under proof loading is about five failures per thousand welds. Over one-quarter million dollars have been saved to date on the crew nacelle spar by the use of flash welding as compared to the original arc welding method.

An interesting phenomenon occurred during the proof loading which illustrates the efficiency of the weld. Since the attachment of wings to crew nacelle spars is necessarily held to very close tolerances, the over-all dimension of the spar caps between hole centers is likewise critical. Dimensions between the 1.75 in. diam attach holes in the spar cap described had to be held to a

(Turn to page 82, please)



- Buell Air Horns are tops in warning signal efficiency.
- Installed as original equipment on many Trucks and Buses.
- They reduce maintenance costs by decreasing stops, starts and slow-downs.
- All records prove that they save tires, brakes, clutches and gears.
- Cut gas and oil consumption.



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Toned Horns—
Built for Service!

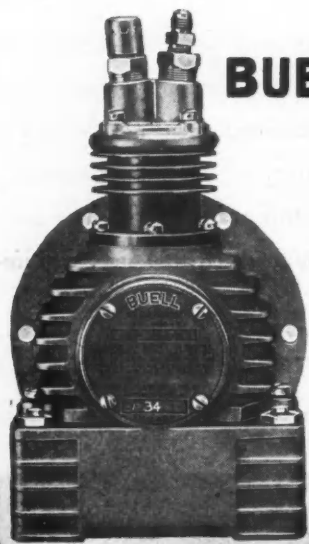
A Buell Air Horn is worth \$100.00 yearly on any heavy highway vehicle. With a Buell the driver has greater security, maintaining a steady cruising speed. Slowing a 20 ton load from 50 MPH to 30 MPH means destroying a lot of energy thru brake lining and tires. It is replaced by burning more gasoline, increasing load on engine, and tires again, to regain speed. This all costs money. We believe \$100.00 yearly is a low estimate. Then remember a Buell will last more than 10 years. How would you rate a \$100.000 investment that earned \$100.00 yearly for 10 years. Ask the man who has a Buell.

BUELL AIR COMPRESSOR

- Used on Passenger Cars, Trucks, Buses, Boats and Planes.
- Small and compact in size . . . efficient and powerful in action.

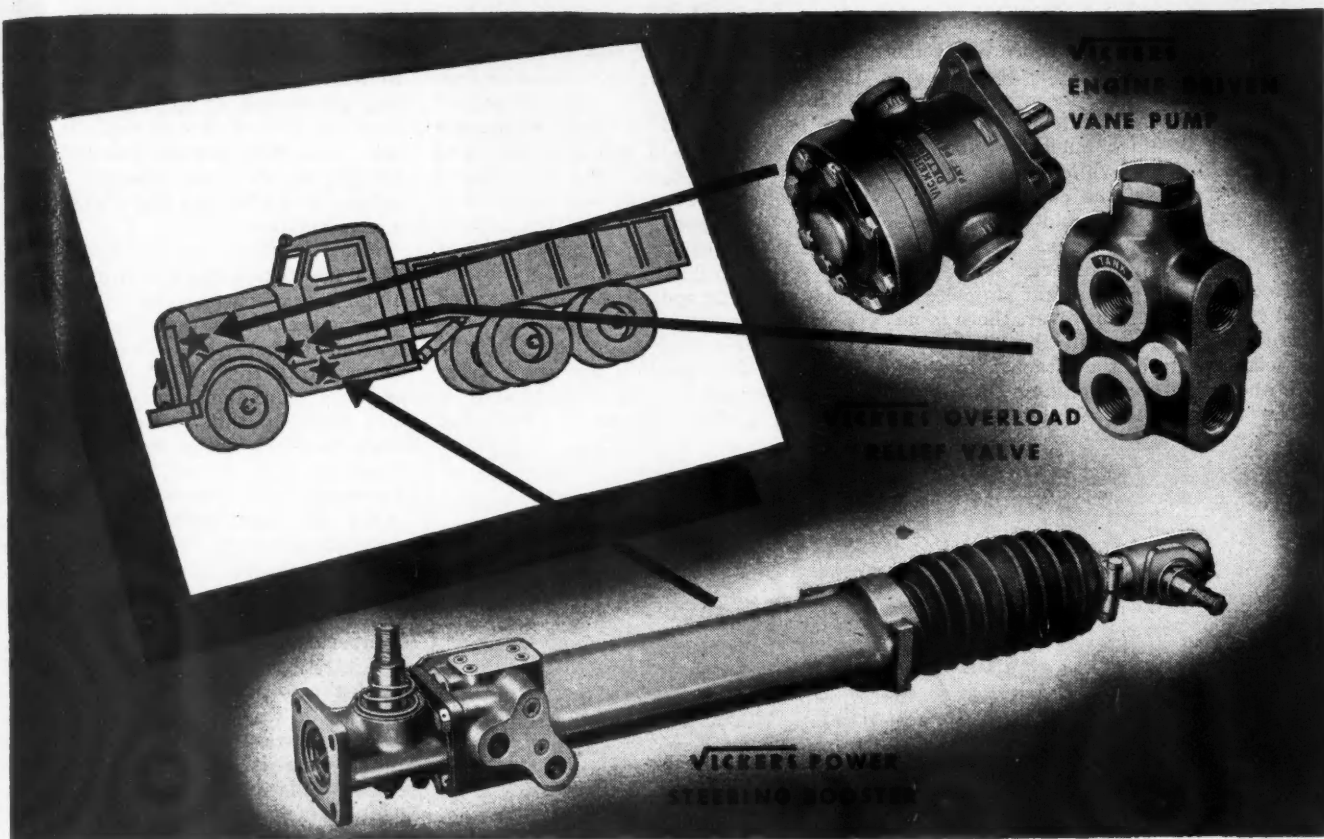
Buell engine-driven compressors supplied air to operate air brakes in thousands of R.C.A.F. aircraft. Only a combination of quality and precision workmanship could meet the requirements of this type of service.

Designed for compactness and light weight, they are far more efficient and powerful than their size indicates. Let us prove their adaptability to your needs.



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Being compact and requiring a minimum of space for installation, the Vickers Hydraulic Power Steering System can be applied to most existing hand steering mechanisms with a few simple alterations. The separate and compact power cylinder (booster) can be located where it does not interfere with other apparatus and where the power will be applied directly to (and in line with) the drag link. No additional space is required at the end of the steering column where space is usually at a premium.

Other important advantages of Vickers Hydraulic Power Steering are: effortless, positive and shockless steering, automatic overload protection, reduced operator fatigue, greater road safety, automatic lubrication, and 14 years of operating experience. Bulletin 44-30 gives complete information about Vickers Hydraulic Power Steering; write for a copy.

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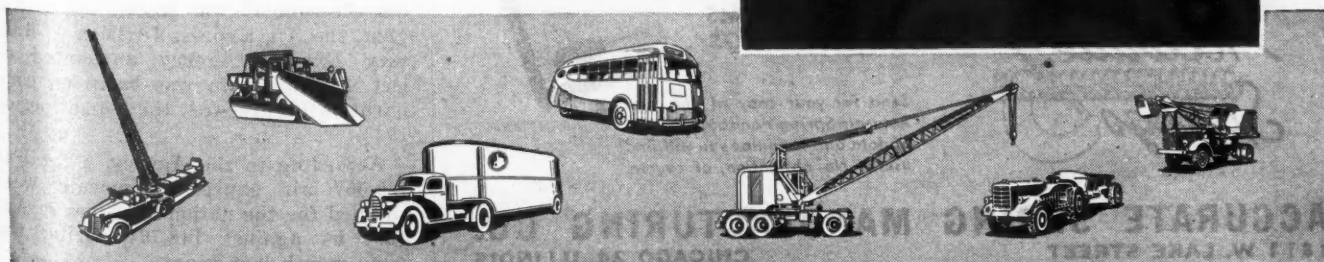
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tolerance of ± 0.002 in. Since the spars were to be proof loaded there was some question as to whether the spar should be finish machined before or after proof loading. The test engineers stated that they could be finish machined prior to proof loading for, while the proof load actually stretched the cap a little better than 0.25 in., it would return to its exact former dimensions. While this was theoretically correct, some felt there was bound to be slight slippage or yield in the weld. However, there is no detectable difference in the dimension between centers of the attach points before and after proof loading.

The tactical purpose of the Black

Widow made low landing speeds necessary. The result of this problem was full span flaps and, an innovation, retractable ailerons. The term "spoiler" has been applied to the retractable ailerons for want of a better name, and because they physically do resemble true spoilers although their function is entirely different. The aileron system of the P-61 consists of a combination of two very small conventional type ailerons and four spoiler panels connected to the aileron control system. The spoiler panels work in unison with the ailerons. The spoilers are made from 0.25 in. magnesium sheet formed in a shallow conical section. They are

mounted in the upper trailing section of the outer wing with the curve or scoop forward. In this position they effect only an amount of lift sufficient to produce the desired rate of roll. It may be said that they control the lift of the wings as do conventional ailerons, rather than spoil the lift of the wing as a true spoiler.

Each spoiler consists of the curved panel mentioned and has two plate stock hinge brackets welded to it. Originally the spoiler panels were formed to contour on the press brake because tapered contour rolls that would handle 0.25 in. material were not available. Spoilage was high by this method even using heated dies. Hot form dies for the hydro press were developed, being carefully worked out for spring-back. Sample parts produced from these dies were quite satisfactory. The first production run from the hydro dies varied in contour from 0.25 in. to 0.75 in. All attempts to correct this condition failed. Temperature of the heated die was carefully controlled, timing of the operation was precise, yet the parts still varied. It was finally determined that the cause was inherent characteristics of the metal itself. The reason for the variation is because the hardness or stiffness of hard magnesium sheet is the result of rolling rather than heat treatment as with aluminum alloys. As a consequence, the mills were unable to control the characteristics as accurately as aluminum alloy can be controlled.

A forming method was worked out after considerable trial and error which is completely satisfactory. This method consists of an electrically heated form shaped to the inside curvature of the panel which is placed on the ram of a stretch press. A sheet of 10 gage steel is loosely curved over the top of the form and is held at each end in the clamping jaws of the stretch press. The forming operation consists of placing pre-heated magnesium sheet on the stretch press form and shoving it up against the restrained sheet metal panel. The panel assumes contour and becomes the male die. It is held in this position for the proper period of time and all spring-back is eliminated. The hinge brackets of the spoilers are also 0.25 in. magnesium sheet and are routed to shape. They are welded by the Heliarc method to the formed panel and the spoiler is complete.



Product planners with springs on their minds will find it helpful to talk things over with Accurate Engineers. For we're planning better products too—better springs, better engineering and better service. These are really more than plans—they have been tested and proved in Accurate's all-out production of fighting springs. Accurate men and machines and methods are ready now to produce the precision springs you'll want for your better products . . . whenever you are ready.



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ACCURATE SPRING MANUFACTURING CO.
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Air Express Shipments

A 14 per cent increase in number of air express shipments handled throughout the country was scored during August, the Air Express Division of Railway Express Agency announced on Oct. 8. This gain was based on comparative figures of the same period 1944.

According to the Agency, a total of 169,557 air express shipments were handled for the nation's airlines in August as against 148,764 during the same month last year.

PERSONALS

(Continued from page 46)

Director of Public Relations.

The Osborn Mfg. Co., Robert H. Boyer, Sales Engineer.

The White Motor Co., Clifford P. Jensen, Parts Service Mgr.

Ethyl Corp., John B. Macauley, Director of Engineering Research, succeeding Earl Bartholomew, who becomes General Mgr. of Research Laboratories.

Allis-Chalmers Mfg. Co., William G. Van Cleef, Director of Industrial Relations.

Republic Aviation Corp., Mundy I. Peale, Vice-Pres. in charge of all sales.

Paul Henry Co., Albert E. Baak, Executive Director of Controls Div.

Plomb Tool Co., M. M. Mautner, Vice-Pres. in chg. of Industrial Relations.

Fairchild Engine & Airplane Corp., Alvin P. Adams, resigned as vice-pres. and director.

Elastic Stop Nut Corp., O. M. Hullinger, Mgr. Chicago offices.

Allegheny Ludlum Steel Corp., Walter R. Breeler, General Mgr., Dunkirk, N. Y.

Ford Motor Co., J. S. Bugas, head of industrial Relations; M. L. Bricker, in charge of Productive and non-Productive Mfg.;

J. R. Davis, Sales and Adv.; C. H. Carroll, Purchasing; R. H. McCarroll, Engineering;

R. I. Roberge, Foreign Operations, and B. J. Craig and H. L. Moekle, Accounting,

Auditing and Finance.

The Cleveland Automatic Machine Co., William J. Chovanec, District Sales Mgr., Cincinnati.

PUBLICATIONS

Tool steel tubing is described in a new 8-page catalog issued by the Bissett Steel Company. It shows photographs of many applications of tool steel tubing, includes heat treating and how-to-order information and contains a current list of sizes available.*

A revised edition of the technical reference booklet on cellulose acetate has been issued by Hercules Powder Co. Included in the plastics material of the revised booklet is a new section on the use of cellulose acetate in thermoplastic laminates. Tables include data on properties of cellulose acetate, solvents useful with cellulose acetate, compatibility of resins, starting formulas for specialty lacquers and properties of cellulose acetate plastics and laminates. Figures show the results of tests, the solubility of low viscosity cellulose acetate and include a blending chart, viscosity concentration curves, etc.*

Paisley Products, Inc., has issued Paisley's Technical Service Bulletin No. 14 describing Dipwrap Hot Dip Protective Compound. It tells how Dipwrap resilient coating provides protection for sharp edged metal objects and effectively protects gears, pinions, etc.*

The Rodgers Portable Hydraulic Press is described in a new catalog released by Rodgers Hydraulic, Inc. Specifications, capacities and other informative details are given. Illustrations show the versatility of the press made possible through its simple, unique design and adaptability to most any heavy duty pulling or pressing problem such as gears, pinions, bushings, etc. Other equipment described in the catalog is shop presses, hooks and lugs for pulling jacks, etc.*

Manufacturers Screw Products Co. has printed a pocket size Library of Engineering Data on vari-colored cards, enclosed in a durable handy pocket envelope. Included are machine screw weights, decimal equivalents and twist drills.*

The Imperial Brass Mfg. Co. has issued a new folder on tubing tools which includes a handy tube-working tool selector. The tools are for use with copper, brass, alu-

(Turn to page 88, please)



PERM-A-CLOR USED CONTINUOUSLY ON RECORD RUN

Aluminum and magnesium aircraft instrument parts required a highly

stabilized solvent in the degreasing process. Except for periodic cleanouts, the DETREX DEGREASER illustrated has maintained production of these important parts 168 hours a week since early in the war. This remarkable record for cleaning soft metal parts—often a troublesome metal cleaning operation—is credited not only to the dependable performance of the equipment but to the fact that PERM-A-CLOR has been used continuously.

PERM-A-CLOR and TRIAD solvents are stocked in every industrial area in the United States. There is a Detrex representative near you.



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MICHIGAN

Solvent Degreasers - Metal Parts Washers - Processing Equipment - Industrial Cleaning Chemicals



DU PONT EXPLOSIVE RIVETS

Here's how these fast-working fasteners

... simplify design

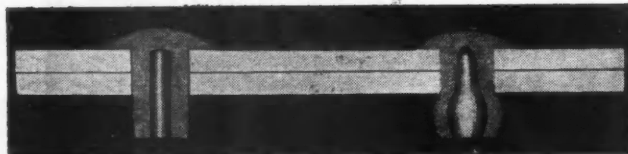
... speed production

Du Pont Explosive Rivets aren't something new. Hundreds of millions have been used in America's famous fighting airplanes... the B-29, Corsair, Martin Bombers and scores of others. They helped simplify design... speed construction.



What These Fasteners Are

Explosive Rivets are just what the name implies. They are fastened in place by expansion of a small explosive charge in the Rivet shank. Instead of using pneumatic hammer and bucking bar (a 2-man job), these Rivets are easily set by one operator.



Cross Sections of Unexpanded and Expanded Rivets

How Explosive Rivets Work

After Rivets are in place, one person applies the tip of an electrically heated Du Pont Riveting Iron to the Rivet heads. Heat fires the charge... expands the shank so that it completely fills the hole. A large barrel-shaped head is formed on the opposite end of the Rivet. This locks the Rivet securely in place. Result: a *strong, tight joint*.

Improved Design for Peacetime Production

Explosive Rivets of a new and improved design* now meet the needs of peacetime mass production. They're ideal

for high-speed blind riveting and all conventional fastening jobs. In many instances they permit simplification of designs and lead to more economical production. Strengths of these Rivets are only slightly less than corresponding solid rivets. Since Explosive Rivets have a neat, smooth appearance, no head-finishing operations are necessary.

(*The improved Rivet has a straight cavity extending the entire length of the shank. This contains the charge. Result: expansion of the shank fills the hole completely. Close-fitting tolerances are unnecessary.)

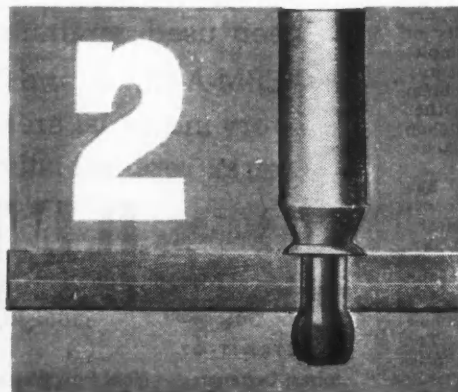
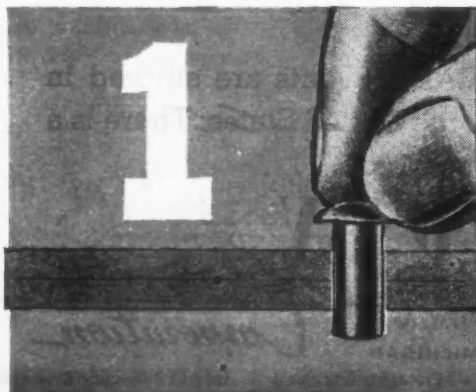
SIZES AND TYPES AVAILABLE

Head Types	Standard Diameters	Grip Lengths
Modified Brazier and Countersunk	1/8" 5/32" 3/16"	1/8" (for thicknesses up to 1/8") 1/4" (for thicknesses from 1/8" to 1/4") 3/8" (for thicknesses from 1/4" to 3/8") 1/2" (for thicknesses from 3/8" to 1/2")
Other head types and diameters will be produced		

MATERIALS

Explosive Rivets are made of various materials:

Aluminum alloys: 17S-T, 52S, and 56S (for magnesium sheet work), Brass, Copper, Mild Steel, Monel Metal and others.



1 Easy to Insert

Du Pont Explosive Rivets are produced with standard diameters. Because the entire rivet shank expands, close hole tolerances are not required. This saves time... assures a better job.

2 Quick to Set

The tip of a Du Pont Riveting Iron** is brought in contact with the head of each Rivet. In from 2 to 4 seconds, depending upon size and type of Rivet, the shank expands to make a strong, tight joint. Couldn't be simpler.

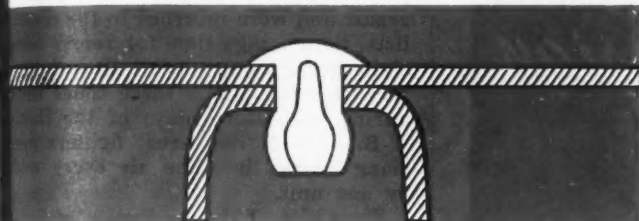
**A riveting iron is available to meet your requirements.

S...now ready for peacetime use

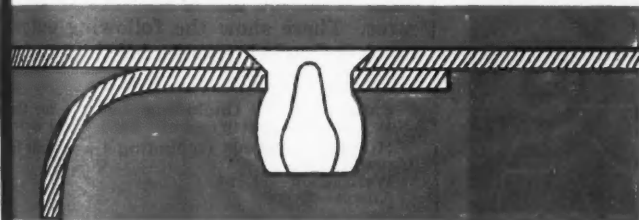
TYPICAL APPLICATIONS



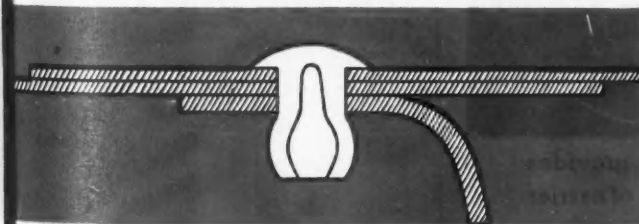
Butt joints, straight or over H-sections.



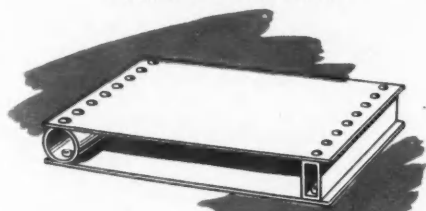
Fastening sheets to hat sections, tubes, ducts, posts.



Joints fastened from one side with countersunk rivets.



Lap joints fastened to ribs.



Fastening sheets to tubes, ducts and similar channels. Tough jobs are made easy.

DU PONT EXPLOSIVE RIVETS

Every Industry Can Use These Speedy Fasteners

AUTOMOTIVE

—Construction and maintenance of chassis, bodies, accessories, parts.

REFRIGERATION

—Cabinet construction for farm and home freezers, locker plants, commercial refrigerators.

HOUSING

—Construction of pre-fabricated houses. Attaching panels, trim and other similar jobs.

AIR CONDITIONING

—Construction and sealing of ducts.

HEATING, VENTILATING

—Fabrication of furnaces, stokers, housings, etc.

RADIO, TELEVISION

—Chassis work, sealing units, cabinet construction.

BOAT BUILDING

—Assembly of small craft; ducts and compartments aboard larger ships.

RAILROAD CARS

—Passenger and freight. Interior panels, accessories, air conditioning systems, refrigerating units.

METAL FURNITURE

—General assemblies, filing cabinets, desks, tables, chairs.

HOUSEHOLD APPLIANCES

—Washing machines, ironers, toasters, etc.

NAME PLATES

—Explosive Rivets hold the plate firmly and permanently in place.

E. I. DU PONT DE NEMOURS & CO. (INC.)
EXPLOSIVES DEPARTMENT, WILMINGTON 98, DEL.

DU PONT

REG. U. S. PAT. OFF.

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For Additional Information**

Pin coupon to letterhead and, if possible, give the details requested below:

- (1) Type of product
- (2) Materials to be fastened
- (3) Total thickness to be fastened
- (4) Type and size of fastener now used
- (5) Approximate annual requirements.

Name _____

Title _____

A-1

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Rivet,
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RIES.

October 15, 1945

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

Britain's Output of Warplanes Revealed

Gradually the story of the growth in output of the British aircraft industry is being unfolded. It is now revealed that from September, 1939, until the end of the war in Europe, the total production of British factories was 125,000 airplanes, of 220 different marks.

At the peak period in 1944, the total number of persons employed in the aircraft industry was near the 2,000,000 mark—engaged in the manufacture of all types of aircraft, heavy bombers, medium and light bombers, fighters,

naval aircraft, trainers, general reconnaissance, air-sea rescue and other types, aero-engines and all types of accessories and spares, and on the repair side.

Sir Stafford Cripps in June, 1944, gave some statistics on the expansion of the British aircraft industry and pointed to the importance of the manufacture of spares; output, he said, was equivalent to 50 or 60 aircraft for every 100 airplanes completed.

Taking the lower figure as the mean, this adds the equivalent of 62,500 aircraft produced in addition to the 125,000 just announced, a total of 187,500.

Figures for engine production have

not yet been disclosed. Sir Stafford stated last year, however, that measuring production by horsepower, output was five-and-a-half times greater than in the first 12 months of the war. Recently, the Rolls-Royce company revealed that during the war years 150,000 Merlin engines had been produced and that production in 1943 was nine times that of 1939. This is but one company, whose production of engine spares increased eleven-fold in the same period.

The repair of aircraft during the war period absorbed a large proportion of the capacity of the industry and although figures are not complete, not having been recorded until the spring of 1940, it can now be stated that 80,000 airplanes were repaired and put back into service, four for every six new aircraft put into service. In one year, 18,000 aircraft underwent major repair and were returned to the combat lists, the average time for repair being eight weeks per casualty. One Spitfire was back for repair three times while during the fateful days of the Battle of Britain 12 "recovered" fighters were being rushed into the air every week by one unit.

Some idea of the production of Great Britain's combat aircraft may be gathered from the manufacturers' own figures. These show the following output for the various types and are as follows:

Spitfire—21,000 (including Seafires for the Navy and 305 Spitfires built before the war).
Hurricane—14,000 (including 1,500 built in Canada).
Wellington—11,391.
Anson—10,000.
Lancaster—9,000.
Halifax—6,000.
Mosquito—6,000.
Beaufighter—5,650* (including 250 built in Australia).
Blenheim—5,400.
Oxford—5,000.
Swordfish—2,399.
Beaufort—2,200 (including 700 built in Australia).
Battle—1,160.
Bolingbroke—700 (all built in Canada).
Fulmar—650.

PUBLICATIONS

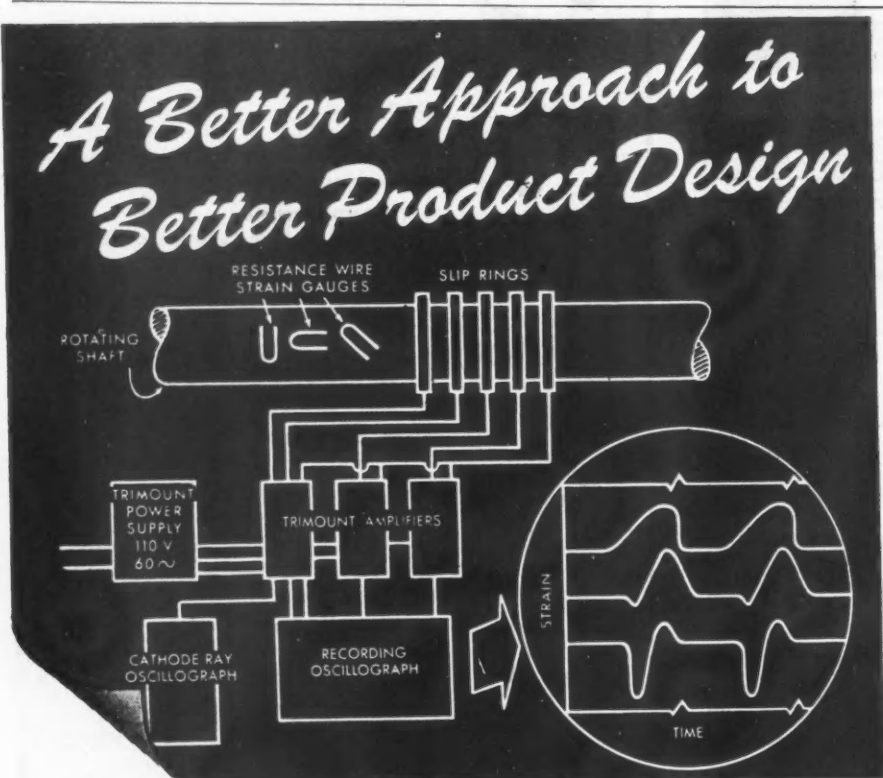
(Continued from page 85)

minum, thin-wall steel and similar tubing. Durite Plastics, Inc., has issued a new two-section pamphlet discussing bonding with Durite 3026, a resorcinol resin glue. Bulletin 23 deals with wood and plywood bonds and Bulletin 23A gives data on the bonding of vulcanized fibre, glass cloth, asbestos, phenolic and hard rubber surfaces.*

All American Tool & Mfg. Co. has released Bulletin 1007 which discusses how vibration fatigue testing of the finished assembly or product ranks with impact, hardness torsion and other tests of the materials that go into a product. Typical installations in the laboratories of manufacturers of electronic and industrial equipment are shown.*

Barber-Coleman Co. has issued two new data sheets, Nos. 82, on 6-key taper splines and No. 83 on 25-tooth sprocket shafts.*

* Obtainable by subscribers within the United States through Editorial Dept., AUTOMOTIVE and AVIATION INDUSTRIES. In making requests for any of these publications, be sure to give date of the issue in which the announcement appeared, your name and address, company connection and title.



● TRIMOUNT Dynamics Measurement Equipment provides new, better ways of developing better products, by use of carrier systems, dynamic pressure gauges, angular accelerometers, torque meters and other electronic devices. The above sketch is an example of TRIMOUNT strain measurement in rotating shafts. Use of the TRIMOUNT carrier system allows visual analysis on a cathode ray oscillograph.

In addition to strain measurements, TRIMOUNT dynamic measurement equipment can also be used to determine:

STATIC AND DYNAMIC PRESSURES • ACCELERATION AND VELOCITIES
VIBRATION • STRESS • TORQUE • LINEAR AND ANGULAR POSITION

Write for additional information

ELECTRONICS DIVISION

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INSTRUMENT COMPANY

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FIND OUT before ASSEMBLY

whether gears

are NOISY.



Gears must be quiet in operation . . . and the time to find out whether they are quiet or not is before they have been assembled. Testing gears before they have been assembled eliminates the necessity of tearing down and rebuilding.

The Red Ring Gear Sound Tester gives you this information quickly and if the gears tested are noisy, it gives you the information necessary to correct the trouble.

One of this machine's principal characteristics is a sound chamber and acoustical horn which amplifies gear noises 50 times. Gears up to 18" O.D. may be run under brake load and center distance setting may be made to precision gage block accuracy.

Write for descriptive bulletin

RED RING PRODUCTS

NATIONAL BROACH AND MACHINE CO.

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SPECIALISTS IN SPUR AND HELICAL INVOLUTE GEAR PRACTICE
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

The Volksjaeger

This jet propelled German plane can reach 19,700 ft in six minutes where it will fly at 522 mph. Specifications for this fighter, the Heinkel He 162, were published in the Oct. 1 issue of **AUTOMOTIVE and AVIATION INDUSTRIES**, page 19.

International News Photo



TO YOUR SPECIFICATIONS

Custom Molded

PLASTICS

(EXTRUSION AND INJECTION)

The same experience and "know-how" which enabled us — during wartime — to work to the close tolerances of rigid government specifications are now available to you for meeting the most exacting requirements of peacetime production. Let us discuss your needs for such molded plastic parts as: moldings, both rigid and flexible, for decorative trim and reinforced edgings; plastic insulated wire and cable for ignition, hook-up, lighting, etc.; rigid tubing and flexible sleeving for liquid and gas convection, or as insulation over bare wire; sheet and strip material 1/8" to 12" in width from which we can stamp small parts or designs in continuous length. Our facilities are at your service. Your inquiry is invited . . .

2 MODERN PLANTS

EXTRUSION
... from 1/8" rod
to 12" sheeting

INJECTION
... from 1 ounce
to 1 pound

• **Molders of:** cellulose acetate, cellulose acetate butyrate, vinylite, ethylcellulose, polystyrene, methyl methacrylate, polyvinyl chloride, nylon.

- **DESIGNERS**
- **DIE MAKERS**
- **MOLDERS**
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SUPERIOR

PLASTIC COMPANY

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Increase in Air Routes

The network of air routes available for the transportation of passenger airmail, and cargo in the United States was increased by 4,034 miles in the first three quarters of 1945. The total number of route miles which the airlines are now authorized to fly by the Civil Aeronautics Board has reached the all-time high of 66,971, according to a survey made by the Air Transport Association of America.

The new routes added to the domestic airline system of the United States up to Oct. 1, 1945, followed the establishment of 8,435 miles of new routes in 1944. The total of 12,469 undertaken in these two wartime years substantially exceeds the country's entire system of airways only 17 years ago.

The principal awards of new mileage thus far this year have involved seven domestic carriers, while others related to comparatively minor terminal changes. The largest single extension in the history of the Civil Aeronautics Board was made when Delta Air Lines received a certificate to add 1,224 miles to its system, both to the North and South. From Cincinnati, Delta was authorized to reach Chicago via Anderson, Muncie, and Newcastle. From Knoxville it was authorized to fly to Asheville and Greenville-Spartanburg. From there, one branch will go to Columbia and Charleston, South Carolina, while another branch will go to Augusta, Savannah, Brunswick, Jacksonville, and Miami.

Other major additions to the airline network were as follows:

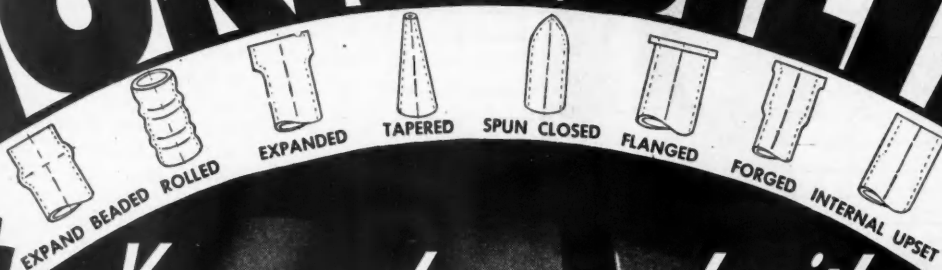
American Airlines received a new addition of 653 miles to its system as the result of a reshuffling of the routes in the northeast section of the country. This same company also gained 43 miles as a result of linking Syracuse, Elmira-Corning, Binghamton, and Scranton-Wilkes-Barre.

Mid-Continent Airlines linked New Orleans with Tulsa, via Shreveport, Texarkana, Fort Smith and Muskogee, with resulting gain of 584 miles.

Continental Air Lines was certificated for 519 new miles with a route between Hobbs and Tulsa via Lubbock, Wichita Falls and Oklahoma City.

Eastern Air Lines was a gainer (Turn to page 92, please)

WORKABILITY



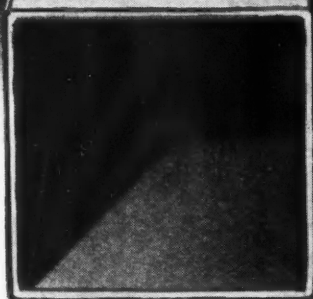
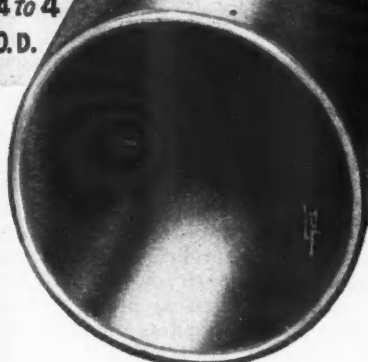
You can do so much with

Michigan

Welded Steel Tubing

SIZES
 $\frac{1}{4}$ to 4"
O.D.

GAUGES
9 to 22



**ROUND • SQUARE • RECTANGULAR
and SPECIAL SHAPES**

Michigan welded steel tube can be flanged, expanded, cold drawn, fluted, flattened, bent, coiled, upset, beaded, grooved, rolled, spun, threaded, tapered, and shaped to

meet every manufacturing demand. • Available in commercial mill lengths or cut to specified lengths, shaped and fabricated, ready for assembly.

Engineering advice and technical help in the selection of tubing best suited to meet your needs.

Michigan STEEL TUBE PRODUCTS COMPANY

MORE THAN 25 YEARS IN THE BUSINESS

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DISTRIBUTORS: Steel Sales Corp., Detroit, Chicago, St. Louis, Milwaukee and Minneapolis — Miller Steel Co., Inc., Hillside, N. J. — C. L. Hyland, Dayton, Ohio—Dirks & Company, Portland, Oregon—James J. Shannon, Milton, Mass.—Service Steel Co., Los Angeles, Calif.—American Tubular & Steel Products Co., Pittsburgh, Pa.—Strong, Carlisle & Hammond Co., Cleveland, Ohio—C. A. Russell, Inc., Houston, Texas—Drummond, McCall & Co., Ltd., Toronto, Canada.



The CENTRIFUGAL PUMPS of *Superformance!*

- More volume per horse power
- Service-free performance
- Compact... Streamlined design

• The advanced design and built-in efficiency of Superflo Pumps gives them increased capacity to the point where, a 1/8 H.P. model is equal in volume delivered to many 1/4 H.P. pumps.

Superflo's integral-streamline design gives compactness, strength and ease of installation. Dependable—service-free in performance, they are ideal for pumping coolants, cutting oils and lubricants, and are easily adapted to any machine. The flow can be regulated from a drip to a full stream without overloading the motor. Capacities from 9 to 44 gallons per minute. Models available for fluids with high abrasive content. There's a Superflo Pump for "superformance" on almost every application... for replacement or as original equipment. Write and tell us your needs.

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SUPERFLO CENTRIFUGAL PUMPS

PORTABLE COOLANT SYSTEMS • PORTABLE PUMPING UNITS
INDUSTRIAL FLUID REFRIGERATION • PARTS CLEANING SYSTEMS

Models for Most
Every Need



For horizontal-
external mounting.



For submerging in
coolant reservoir.



For submerging in
tank, or mounting
to cover.



For submerging in
tank, or mounting
integrally with
cover.

the extent of 693 miles with an extension from Columbia, S. C., to Detroit via Charlotte-Winston-Salem, Greensboro-High Point, N. C.; Roanoke, Va.; Charleston, W. Va.; Akron and Cleveland.

Colonial Airlines was given a 715-mile addition to its system by a combination of route extensions, the result of which was to give this company a link between Washington and New York in this country, with Ottawa, as well as Montreal in Canada. From Washington, the new set-up will take Colonial through Baltimore, Reading, Scranton-Wilkes-Barre, Binghamton, Syracuse and Watertown to Massena, N. Y. Thence one branch will go to Ottawa and the other to Montreal. The line will still operate to Montreal from New York City via Burlington, Vt. From Burlington it is now authorized also to go to Massena, thence to Ottawa.

Pennsylvania-Central Airlines gains 46 miles and a link between Rochester, N. Y., and Washington, D. C., with a route that will now tie in Williamsport, Elmira-Corning, Rochester and Buffalo.

Unofficial American Altitude Record

A new unofficial American altitude record was credited to the Bell jet propelled P-59 Airacomet in an announcement made by Bell Aircraft with the permission of the Air Technical Service Command.

The No. 1 YP-59, first production model of the famed Airacomet series, performed the feat, and although the achievement was registered almost two years ago, its revelation was withheld until now for security reasons. In fact, the same propellerless plane, operated by two different pilots and equipped each time with full military load, accounted for new record heights twice within four months.

Jack Woolams, chief test pilot for Bell Aircraft, took the jet plane up to 47,600 ft in a flight from a test base near Muroc, Cal., Dec. 15, 1943. Four months later, the late Major E. W. Leach, test pilot for the ATSC, reached 47,700 ft in the same plane, 100 ft beyond the altitude attained by Woolams.

Woolams and Major Leach reached the heights of more than nine miles at a time when the P-59, the nation's first jet propelled plane, was still a closely guarded military secret, which largely explains why the announcement was not made prior to this.

At the maximum height reached by Woolams, one of the General Electric turbo jet engines, which give the Bell designed and built fighter plane its propulsion, ran out of oil. Woolams shut off that jet engine and landed on one power unit. He expressed the opinion that he would have exceeded an altitude of 50,000 ft if he had not encountered engine trouble. It was the second time within five months that the

(Turn to page 95, please)

Unofficial American Altitude Record

(Continued from page 92)

27-year-old flier, who was then Bell's senior experimental test pilot, penetrated far into the stratosphere. On July 14, 1943, he got to 45,765 ft before extreme temperatures influenced him to return to the earth.

Both of these distances are in excess of the United States altitude record of 43,166 ft for heavier-than-air aircraft, set June 4, 1930, by Lt. Apollo Soucek in a Wright Apache. The international mark of 56,046 ft is held by Col. Mario Pezzi of Italy, who set that record on Oct. 22, 1934, in a Caproni 161.

On the July 14 flight, Woolams took up the second jet propelled plane ever to be built in this country. Since the cabin was equipped with a makeshift heater, Woolams found it necessary to open the cabin ventilator every few minutes, and consequently temperature in the cabin became very low. Side panels of the cockpit were frost covered, confining vision to the front windshield alone.

During his descent, frost began to disappear but a thick layer of moisture formed in its place and the visibility was confined to the side when he landed. Most of the instruments were still frost covered as he climbed out of the cockpit in desert heat.

Woolams used a pressure demand oxygen regulator and mask and underwent no discomfort or lack of oxygen. Despite the intense cold in the cockpit, he felt no fatigue or other unusual symptoms. Prior to the take off, he breathed pure oxygen for 15 min through a continuous flow mask with standard sized bag.

On the second and higher flight, he had a pressurized cabin and the temperature within the cabin at 47,000 ft was a comfortable 60 F. On both occasions Woolams wore a heavy winter flying suit but said that with the pressurized cabin, it would have been feasible to operate in light summer flying equipment if there was not always the possible chance of the necessity of a parachute jump.

Bell's assistant chief test pilot, Alvin Johnston, climbed the YP-59 45,910 ft on Jan. 19, 1944.

Westinghouse Purchases

Pennsylvania Plant

The Westinghouse Electric Corp., Pittsburgh, Pa., announced it would purchase property and buildings in Meadville, Pa., for the production of industrial heating equipment.

The property, comprising more than five acres of land and five major buildings with more than 100,000 feet of floor space, is being purchased from Talon, Inc., the boards of directors of both companies having approved the sale. The entire Westinghouse line of industrial heating equipment will be

produced in the Meadville plant. This includes many types of furnaces and other devices for heat-treating, driers, immersion heaters, space heaters and thermostats. Westinghouse will employ from 150 to 200 persons in this new production unit. The reconversion and remodeling of the plant will be begun immediately and production should be well under way by mid-January.

The shifting of this manufacturing from the East Pittsburgh Works and the Mansfield, Ohio, plant of the Electric Appliance Division will not affect total employment in either of these locations.

Special Finish on Fireball Plane

An air-foil pyroxylin seablu lacquer, specially developed by Du Pont, is said to help give great speed to the Navy's newly announced FR-1 Ryan "Fireball," the fighter plane with a conventional motor in the nose and a supplemental turbo-jet unit in the rear.

The Fireball's top coat had to be flexible to withstand vibration at extremely low temperatures. It is similar to the finish provided for the Army's P-80 "Shooting Star." A special thinner had

(Turn to page 96, please)

Specify **ROCKFORD** — SPRING LOADED — for **CLUTCHES**

LIGHT PEDAL PRESSURE

CUSHIONED ENGAGEMENT *

VIBRATION DAMPENING

ACCURATE BALANCE

DIRT EXCLUSION

HEAT DISSIPATION

LIFETIME ADJUSTMENT



* The cushioning spring arrangement between the facings in ROCKFORD Spring Loaded CLUTCHES provides cushioned engagement that enables smooth pick-up of the load, without grabbing or chattering. The springs maintain ample pressure to assure the required torque.

SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION

It shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS.

Contains diagrams of unique applications. Furnishes capacity tables, dimensions

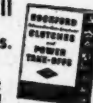
and complete specifications. Every production engineer will find help in this handy bulletin, when planning post-war products.



ROCKFORD CLUTCH [FORMERLY KNOWN AS] **DIVISION**

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BOCG-WARNER CORPORATION



to be evolved to allow the exceedingly fast-drying lacquer to flow out to a smooth film, thereby minimizing compounding.

Aircraft-type putty is used to fill surface imperfections on the leading edge of the wings. A Du Pont zinc chromate primer is applied to help protect the metal from corrosion. Over this a liberal coat of surfacer is applied and sanded, followed by the top coat, which is polished to glass-like smoothness through the use of rubbing compound and spray wax, both made by the Du Pont Finishes Division.

New Sulzer Designs in The Heat Engine Field

In the special number of their *Technical Review* of December, 1941, Sulzer Brothers outlined their work in connection with the supercharging of two-stroke Diesel engines and the further development of the Sulzer internal combustion engine up to the gas turbine. The viewpoints and principles exposed at that time have been meanwhile put to work.

In the field of the non-supercharged high-powered marine engine Sulzer

Brothers have completed the standardization of their various types begun before the war. The project called for a standard design for elements which previously differed for almost every engine type (pistons, cylinder covers, bed-plates, connecting rods and bearings, fuel injection pumps, starting devices, governing apparatus, etc.) so that these could be reduced to a small number of standard forms. The parts in question can now be used indiscriminately for different sizes and numbers of cylinders and as far as possible for different categories of engine (stationary and marine), which greatly facilitates their manufacturing and stocking.

A high-supercharged, two-stroke, opposed-piston marine engine has for some time been on the test bed and has now completed the first part of its trials. The particulars of the engine are as follows: 6 cylinder of 320 mm (12½ in.) bore and 2 x 400 mm (15½ in.) stroke, supercharging pressure 28 psi abs., mep 152 psi, 4000 bhp at 440 rpm crankshaft speed and 110 rpm propeller shaft speed. For the first tests the scavenging pumps were retained and a supercharging set consisting of exhaust-gas turbine and axial compressor was also used, as pre-compressor set for the pumps. The delivery pressure of the axial compressor reaches full supercharging pressure at full load, but decreases correspondingly at part load. Reversing the engine is simple, as no special measures need be taken to prevent the blower from being reversed too. A series of trials has confirmed expectations regarding power and efficiency: a fuel consumption of .361 lb per bhp hour was obtained at the first trials.

The next step will be made with the equipment the engine is finally destined to have, i.e., with piston-type supercharging pumps, without the axial compressor, and with an exhaust-gas turbine mechanically coupled to the engine through an hydraulic coupling. During reversing operations the exhaust-gas turbine is cut out, the engine developing 65 per cent of its full output when running astern without turbine power. The second series of trials with this form of equipment will begin this fall. With regard to space requirements, a high-supercharged engine of this design offers definite advantages over conventional present-day solutions. It is as short as a double-acting engine of the same power, no broader than a corresponding single-acting engine and lower than the engine of an equally powerful geared plant. Its weight is lower than that of any other type of high-powered marine Diesel plant, attaining with reduction gearing and thrust bearing a figure of only 39.5 lb per shaft horsepower.

The high-supercharged, opposed-piston, two-stroke engine shown in the special number of the *Sulzer Technical Review* already mentioned has been sub-

(Turn to page 116, please)

NITE HAWK



5 IN 1 MACHINE

1. Designed especially for starting all airliners, cargo and private planes. Produces 500 amperes of electric power—both 12 or 24 volts.
2. Lights runway. Seven million candle power adjustable searchlight throws 1½ miles of light.*
3. Lights apron, ramp . . . ideal for localized operations lighting—has two 80,000 c.p. adjustable floodlights.
4. Provides emergency power . . . 110 or 220 volts, 60 cycle, a.c. current.
5. Inflates tires—gives you compressed air at 80 lbs.



*All models can be supplied with combinations of searchlights and floodlights.

The Nite-Hawk Aero-Starter performs all services necessary on an airfield at a fraction of the normal investment. Portable, engine-driven, it operates independently of other power sources. Investigate this money-and-time-saving, all-purpose machine.

Write for Bulletin NH12A



Lister-Blackstone

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MFRS. OF PORTABLE NITE-HAWK AERO-STARTERS, SEARCHLIGHT AND FLOODLIGHT UNITS
ALSO DIESEL ENGINES AND DIESEL-ELECTRIC POWER PLANTS

OF THE ORIGINAL STEEL BAR MACHINABILITY

The hydraulic cylinder piston at the left was made from a 2½" round steel bar (NE-8630)—machined to shape on a turret lathe, drilled at both ends and tapped at one end. It then was heat treated to 125,000 lbs. per sq. in. minimum tensile strength, ground and polished, chrome plated and again polished.

But of greater importance is the fact that in producing this part it was necessary to machine away 85% of the original bar. That called for "top" machinability—an important reason why Republic Union Cold Drawn Steel was used.

For more than half a century, the words "UNION DRAWN" have stood for UNIFORMLY HIGH MACHINABILITY—without sacrifice of surface, physicals, soundness, tolerance, response to heat treatment or other qualities.

During these 50 years, intensive laboratory research and unequalled experience acquired in parts producers' plants have resulted, time and again, in improvements in the machinability of Republic Union Cold Drawn Steels. And as new ways for further increasing machinability are discovered, they will be applied to these steels.

If machinability is a vital factor in your production, Republic Union Cold Drawn Steels may be just what you need to step up efficiency and increase output—to benefit from faster speeds, heavier feeds and longer tool life. Republic metallurgists are ready NOW to help you produce better steel parts at lower unit cost.

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SAFEGUARD FLUORESCENT LAMPS with . . .



G-E Watch Dog Fluorescent Starters have been providing efficient and economical service for 30-, 40- and 100-watt lamps in commercial and industrial lighting fixtures for several years. These manual reset starters have saved many manhours of maintenance. They've extended the life of fluorescent lamps with precision starting and positive stopping. Users of fluorescent lighting, engineers and maintenance men all over the nation are switching to Watch Dog Starters, the preferred safeguards for fluorescent lamps.

These three prefer G.E.

1. **USERS** in stores, offices and factories appreciate lighting fixtures equipped with Watch Dog Starters because they eliminate annoying blink once and for all.
2. **LIGHTING ENGINEERS** specify Watch Dogs because their precise construction provides unusually long life. The G-E Watch Dog Starter outlasts five ordinary starters.
3. **MAINTENANCE MEN** like Watch Dogs because they reduce lighting maintenance to the simple job of pushing a red button before relamping. Reset it . . . forget it.

For the complete story about G-E Watch Dog Starters, write to Section G1055-103, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

GENERAL ELECTRIC

Engine Ignition Faults Televised

An apparatus which televises the location and nature of engine ignition faults without direct access to the engine has been developed by D. Napier and Son and English Electric Co. of Great Britain. The ignition performance is thrown pictorially on a screen while the engine is running.

The picture consists of a row of peaked figures, one for each spark plug, arranged in the firing order of the engine, starting from a selected cylinder. Perfect ignition gives a steady row of identical figures, but any fault anywhere in the ignition system alters the shape of the figures in a characteristic manner. A faulty plug affects the corresponding figure, and can be identified from its position in the row, while a defect in the magneto or the distributor alters the shape of the whole row of figures. Intermittent defects cause the figures affected to flicker in step with the defect.

No experience is necessary in order to locate a faulty plug, and the diagnosis of the nature of the defect is greatly aided by the fact that the shape of the figure is suggestive of the defect itself. An excessive spark gap gives a high figure and a short circuited gap gives a low figure. An occasional miss, which is a common trouble, gives a corresponding flickering up of the figure, which is instantly obvious.

The instrument also enables an estimate of the quality of the magneto and plugs to be made, and possible breakdown forestalled, irrespective of whether the ignition is performing correctly or not. For this purpose the instrument has an attenuator dial which consists of a stepped resistance which shunts the primary current in increasing amounts as the dial is operated. By operating the attenuator while watching the figure it can be seen that the plugs with the widest gaps, or the most fouling, miss fire first as the spark weakens. Plugs, with excessively small gaps can also be detected, and a weak magneto or coil is detected because general missing occurs on all the figures at a dial setting below normal. The instrument is about the same size as a portable typewriter, and is arranged to take its power supply either from 220 volt A.C. mains, or from a six, 12 or 24 volt battery, as desired. It can be used on the aircraft while in motion, if necessary. It can be adopted as a switchboard instrument for the routine supervision of a group of engines, as in a multi-engined aircraft or boat, or in an engine test house.

With a single ignition tester fitted into the instrument board of a multi-engine airliner, the ignition of each engine can be checked before take-off, and ample warning of any impending breakdown can also be obtained while in the air. The whole process is said to take only a few minutes, the time necessary to turn the selector switch on the instrument and glance at the line of figures.



*Convenient,
comfortable,
hospitable
—that's Cleveland's
favorite hotel*

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CLEVELAND, OHIO

Directly Connected
with
Union Passenger Terminal

why

RAYON

has a big future

in Natural and Synthetic Rubber Tires

The Best for Uncle Sam

Scientists demonstrated it and the war proved it: rayon makes a tire of natural rubber, *better*, and a satisfactory heavy-duty tire of synthetic rubber *possible*. By using rayon in tire construction, tires are made lighter and safer; run cooler and longer. That's why Uncle Sam tagged rayon for military service. That's why rayon for tires is here to stay, no matter what kind of rubber the future holds for tires.



Microscopically Speaking

Your naked eye won't show you the advantages of rayon over natural fibers. There are two ways to prove it; one's by rolling on rayon—the other's by the magic eye of the microscope. Here's what it shows:

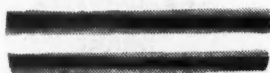
Rayon Fibers are Solid



Natural Fibers are Tubular



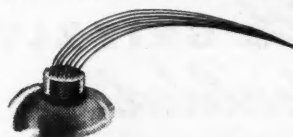
Rayon Fibers are Regular



Natural Fibers Twist and Curl



Rayon Fibers are Continuous



Natural Fibers are Short—Vary in Length



These differences in cross-section, shape and length are what give rayon its greater strength per unit of weight.



On the Up and Up

So important is strength in tire yarn, that Industrial Rayon takes special pains to preserve it. Only Tyron, Industrial's tire cord, is made by the "up-twisting" method instead of conventional "down-twisting". Thus the yarn is subjected to less abrasion and all of its original strength can be retained.

Free "Rolling on Rayon." Send for this new booklet on rayon for tires. It contains all the facts you'll want to know. Address Industrial Rayon Corp., Cleveland 1, Ohio.



TYRON

Reg. U. S. Pat. Off.

Rayon for tires

Made by INDUSTRIAL RAYON CORPORATION
Cleveland, Ohio

Expansion of Automobile Plants

(Continued from page 17)

necessary. This admittedly would require three shifts, but that would be possible with increased capacity in bottleneck departments which previously had put a restraint on assembly lines. The construction of the new Flint plant puts the damper on rumors that General Motors will largely decentralize its operations after the war. The fact is that it always has decentralized to some extent and that policy will continue, but in no greater degree than formerly. Chevrolet so far has operations in 18

cities in 10 states, and has tentative plans for a plant at Cleveland for production of the lightweight Chevrolet.

Buick Division recently announced the greatest expansion program in its history. Many of the installations were particularly outmoded before the war and the Flint works will be modernized and enlarged to make possible the production of 550,000 cars a year, which the division has set for its goal. Buick probably will be turning out 1700 cars a day at the outset on two 8-hour

shifts, or about 105 per hour. To reach the ultimate peak output of more than half a million cars a year, production eventually will have to be stepped up to approximately 2400 per day. The expansion program calls for erection of a new assembly plant and sheet metal building to replace structures more than 40 years old, and extensions to existing engineering and experimental buildings. Construction will aggregate about 1.3 million square feet of new floor space, in addition to modernization of other plant property. Employment is expected to reach 22,000, a 40 per cent increase over the prewar peak.

Pontiac Motor Div. also is setting its sights high for postwar production and has entered a \$30 million expansion program, the greatest in its history, to provide capacity for 500,000 cars annually, an increase of about 170,000. Approximately \$3 million will be spent on expansion of the foundry alone. Other production units that will be expanded and improved are the engine plant, axle plant, assembly unit, sheet metal plant, heat treating and car shipping departments. The program will add about 1.1 million square feet of floor space. A large plant completed in 1942 for production of aircraft torpedoes already is in operation as a parts depot. Postwar employment is expected to hit 16,000, approximately 4700 more than in 1941.

Oldsmobile Division of GM is stepping up production of all departments to meet the goal of 450,000 cars a year, nearly twice prewar output. Expansion plans include two additions to the pressed metal plant, one 209 by 170 feet and the other 180 by 170 feet; and construction of a new materials receiving and shipping building, 548 by 60 feet. The division also will have the services for the first time in car production of its multi-million dollar forge plant which was built in 1940, but never utilized for automobile forgings because of the war. The original floor space of 170,000 square feet was expanded in 1944 to approximately half a million. The forge unit will supply all automotive forgings for Oldsmobile as well as for allied GM car divisions. Employment at full production is expected to hit 14,000, about 40 per cent over 1941.

Besides home expansion at Buick, Pontiac, and Oldsmobile, GM is planning four B-P-O assembly plants in addition to the two which existed before the war at Linden, N. J., and Southgate, Calif. Locations which have been announced are Wilmington, Del.; Atlanta, Ga., and Kansas City, Mo. The Wilmington plant will be on a 125-acre site, of one-story construction, and will contain about 1.0 million square feet of floor space. Details of the Kansas City and Atlanta installations have not been announced except that the former site contains approximately 300 acres and the latter about 250 acres.

(Turn to page 104, please)

SHEER STOPPING POWER

Right from the word "GO!"



*With GRIZZLY
Moulded
Brake Lining*

FOR EVERY
AUTOMOTIVE
BRAKE
REQUIREMENT

Right from the word "GO!"—from the exclusive Grizzly asbestos-friction compounding right through the moulding process under hundreds of tons of pressure to the final finish grinding . . . every step is motivated by a single purpose, to provide in Grizzly Brake Lining the "finest product of the brake lining industry!"



"Bear in Mind"

Read how it's done in "Building UP to A Name," a free book for engineering and production executives. Write Grizzly Manufacturing Company, Paulding, Ohio.

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BRAKE LINING



Here's Strength and Toughness* to Take the Place of **MASS** *Formability, too

N-A-X HIGH-TENSILE steel ties in with the modern trend in the nation's automotive industry away from mass toward lighter, more efficient designs.

Its great inherent strength and toughness—made practical by the exceptional formability of this fine-grained steel—can be applied to cut down deadweight or increase strength in a score of automotive parts. Frames, wheels, spring suspensions, torque arms, engine supports, body parts and bumpers are examples of automotive parts

that can benefit by the outstanding properties of N-A-X HIGH-TENSILE steel.

Let's boil it down to this: Where reduced mass and weight are desirable, N-A-X HIGH-TENSILE can cut them down without sacrifice of strength. Where increased strength and durability are demanded, N-A-X HIGH-TENSILE can do the job using the same sections. And where strength combined with exceptional cold-formability is the primary goal, as in the case of bumpers, N-A-X HIGH-TENSILE is outstanding.

GREAT STEEL
FROM
GREAT LAKES

GREAT LAKES STEEL

Corporation

N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN

UNIT OF NATIONAL STEEL CORPORATION

Location of the fourth assembly point has not been divulged officially, but it is reported that Boston, Mass., is a likely possibility.

Fisher Body Division also is entering into a sizeable expansion program. Two new plants will be built in Ohio at Columbus and Hamilton. The Ternstedt Division will operate the Columbus unit, which will manufacture hardware and fittings for Fisher body. It is expected that the plant will be completed by Spring. The new Fisher unit at Hamilton will turn out body stampings and sheet metal components used in body assembly. Operations are ex-

pected to get underway by early Summer. In addition to the new plant construction, Fisher is expanding facilities at Janesville, Wis., and Lansing, Mich. Two large and four smaller buildings will be built at Lansing to provide greater manufacturing capacity. The program will provide an additional 175,000 square feet of floor space and will be used primarily for warehouse facilities. The expanded facilities will bring an increase of about 20 per cent in employment over peak prewar levels. A new extension to the office building and a number of improvements in plant layout at Janes-

ville will result in an increase of approximately 75 per cent in employment over the prewar peak.

GM also has announced plans for construction of a new plant near Elyria, Ohio, to be operated by a new division which will produce bumper guards, grilles, and similar items formerly made by Brown-Lipe-Chapin Division at Syracuse. The building will provide about 400,000 square feet of floor space and is expected to be in operation within a year, employing approximately 2000 persons.

Ford plans for expansion call for construction of four new assembly plants, which will bring the total to 19 throughout the country. Here again, as in the case of General Motors, it is not a case of decentralization, since the company has always had branch plants outside Detroit. Before the war, Ford had 15 branch plants which accounted for more than 80 per cent of total assembly. At one time, the company operated 32 plants, but this had dwindled to less than 10 during the depression. Now the trend is toward more branches, although it is not thought likely that the number ever again will approach the high-water mark of the Twenties.

Two of the new assembly plants will be at St. Louis and Atlanta, Ga. The other two plants are to be built at Los Angeles and in Raritan Township, N. J., both of which are to be used to assemble Mercury and Lincoln cars. Ford also will erect a parts depot at Denver to supply Ford passenger car and truck parts to that territory.

The new Ford assembly plant in New Jersey, located on a 78-acre tract about 30 miles from New York City near Metuchen, will have 500,000 sq ft of floor space and a capacity of 350 cars a day. The Atlanta plant will be a one-story structure with capacity for assembling approximately 350 cars a day. The St. Louis unit will also be a one-story building, but will be somewhat larger, containing about 850,000 square feet. It should be remembered, too, that Ford has located on its property at the Rouge two Government plants—a magnesium foundry and the aircraft engine building—which it probably will acquire, although nothing official on this has yet been announced.

Studebaker Corp. is backing its determination to remain the largest producer among the independents with a \$16 million postwar program that involves nearly every department. Thirteen old buildings on the main plant site at South Bend will be razed and construction of a modern building with covered loading dock will provide approximately one-quarter million square feet of floor space. A four-story building formerly used for storage and car driveway and comprising about 529,000 square feet is being revamped for car manufacture. Facilities are being increased to make possible a consistent assembly line pace of nearly one passenger car a minute. In 1941, this rate

(Turn to page 108, please)



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Specialists in Aluminum Permanent Mold Castings

- Sterling's modern foundry, patented molding process, quality materials, and expert workmanship have been, for years, producing the finest in aluminum pistons.
- This same expert workmanship and patented molding process has enabled us to develop many special permanent mold aluminum castings for the automotive and aviation industries.
- Wherever a minimum of finishing and light weight is a factor, our engineers' experience will be of value to you in developing a permanent mold aluminum casting to economically meet your requirements. Call or write

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Scores of War Plants

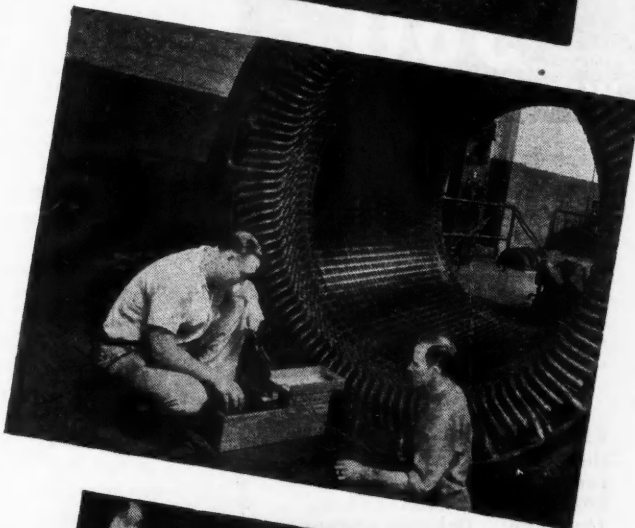
FOR FASTER REPAIRS

Local Westinghouse Manufacturing and Repair Plants are especially equipped to repair, remodel or recondition your electrical machines or apparatus. This service includes rewinding motors, generators and transformers; rebuilding commutators; replacing or building up worn parts. Special testing equipment is used for dynamic balancing and high-frequency testing.



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For major electrical and steam repairs, there are Westinghouse engineers near you with wide experience on repairing such equipment. They are prepared to diagnose your electrical and steam troubles, give you emergency repair service, and help you with engineering problems.



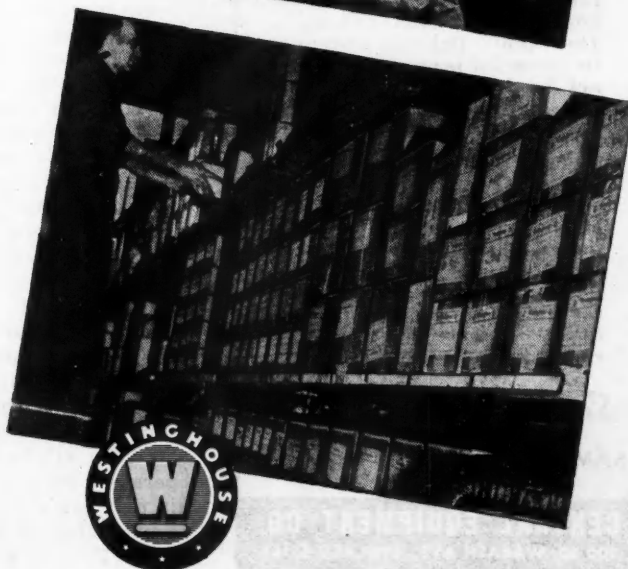
FOR RENEWAL PARTS SERVICE

Prompt delivery of standard renewal parts can be obtained from your closest Westinghouse Renewal Parts Warehouse. Stocks on hand include parts normally subject to wear or burning, such as contact tips, shunts, arc chutes, operating coils, armature and field coils, bearings, etc.



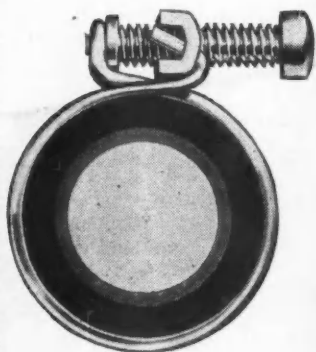
NEW MAINTENANCE MOVIE

If you have not seen the new Westinghouse movie, "Theory and Maintenance of Commutation", call your nearest Westinghouse office for information about showing the film to your maintenance group



New!

**A POWERFUL CLAMP
with 360° of
UNIFORM
CLAMPING POWER**



**CENTRAL
"360"
WIRE HOSE CLAMP**

Unlike other preformed clamps, the Central "360" provides unlimited clamping power . . . and remains a constant perfect circle with equal pressure over the entire 360° circumference of the hose . . . regardless of the amount of tightening pressure applied.

DEPENDABLE

Clamping power, even on synthetic hose, is unaffected by rough castings or variations in hose diameter and resistance. The "360" tightens instantly. Its powerful pressure grip cannot be loosened by the most severe vibration.

EFFICIENT

No other preformed clamp equals the "360" for power, efficiency or speed of application. It is America's newest, most advanced wire hose clamp — guaranteed unconditionally for use on all water, oil, gasoline, air and high pressure connections.

Send Today for Free
SAMPLE & BULLETIN No. 101

CENTRAL EQUIPMENT CO.
900 SO. WABASH AVE., CHICAGO 6, ILL.

could be maintained for only one shift, while other departments worked two or three shifts to stockpile enough parts to keep the assembly line going. Studebaker is laying out considerable capital for batteries of fast, semi-automatic machines patterned after the aircraft production equipment used by the company during the war. The foundry, closed during the war, is being reopened and re-equipped with the most advanced machinery available. Studebaker's president Paul Hoffman stated recently that his company's postwar annual production goal is 300,000 units a year. Commercial car production is scheduled to be tripled over the prewar peak. A new truck-cab manufacturing building and freight receiving warehouse will be completed by the end of this year.

Nash, which has charted a production goal of 250,000 cars a year, three times that of prewar, is in somewhat better shape than other independents on facilities, since it modernized its plants for production of its "600" model which was introduced shortly before the war. Outlay at the Milwaukee plant was about \$3 million and at Kenosha \$4.5 million. During the next year Nash plans to spend \$2.25 million at Milwaukee and an additional \$4 million at Kenosha for factory expansion. The company also is reorganizing its central parts depot and service planning unit at Milwaukee in order to handle the expected increase in volume. While no decision has been announced concerning the company's plans for acquiring the plant at Lansing which it has been operating for the Government, it is understood that such a move does not figure in present planning.

Details of Packard Motor Car Company's expansion program still are in a fluid state. George Christopher, president, revealed recently that about \$10 million will be spent postwar. The company acquired the Bundy Tubing plant in Detroit to accommodate war work and to free up space in the Packard plant for reconversion, but no announcement of ultimate use in peacetime has been made. It is felt, however, that some use will be made of the 130,000 square feet there in view of the company's announced intention to double passenger car output to 200,000 annually, and to broaden its base to include aircraft, marine, and industrial engine applications. Considerable modernizing and revamping of plant layout at the main plant now is underway, with the assembly line being extended 600 feet. A production rate of about 45 cars per hour is expected when operations get smoothed out. It is reported that while the aircraft engine research program which Packard is carrying on for the Army Air Forces at Toledo will be retained, the facilities operated during the war for making aircraft parts do not figure in the company's automotive plans.

(Turn to page 112, please)

**FOR PRECISION
MACHINING**

**Insist
On**

**OAKITE
SOLUBLE
OIL**

Its rust-preventing properties and remarkable resistance to rancidity make Oakite Soluble Oil widely useful on an ever-widening variety of machining and wet grinding operations. It provides a uniform, stable, well-balanced emulsion that contributes to precision work, better finish and extended tool life. Because of its greater dilution ration, this high quality product is extremely economical to use.

Try Oakite Soluble Oil, for example as a coolant on wet grinding. You'll be convinced that it keeps wheels clean and free-cutting, makes frequent dressing of wheels unnecessary, assures a better finish, and eliminates rusting.

Oakite Soluble Oil, in machining or wet grinding operations is fully described in a 20-page booklet. It may be had FREE for the asking! Call your local Oakite Technical Service Representative, or write us direct.

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Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE *Big Bonds for Victory*
Specialized cleaning

MATERIALS & METHODS FOR EVERY CLEANING REQUIREMENT

can have it,* too

PROTECTION OF CONSTRUCTION

G-E STANDARD Tri-Clad Induction Motors Now Available to 2000 hp

For that important *big drive* (up to 2000 hp, 1800 rpm) you can now get a G-E standard Tri-Clad induction motor. All the protective features that have proved so valuable to service continuity and long life in the more widely used sizes are included:

EXTRA PROTECTION FROM PHYSICAL DAMAGE

—Cast-iron construction with upper portion completely enclosed to keep out falling objects, dripping liquids. Streamline, cast-iron end shields. Corrosion-resisting finish.

EXTRA PROTECTION FROM ELECTRICAL BREAK-DOWN

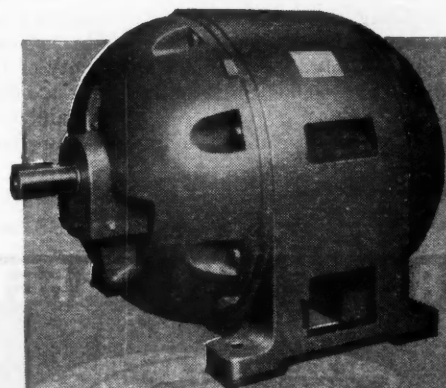
—Windings of Formex* wire are solidly bonded with synthetic resins strongly resistant to heat, oil, and moisture. Formex wire insulation stands up strongly under abrasion or "heat-shock."

EXTRA PROTECTION FROM OPERATING WEAR AND TEAR

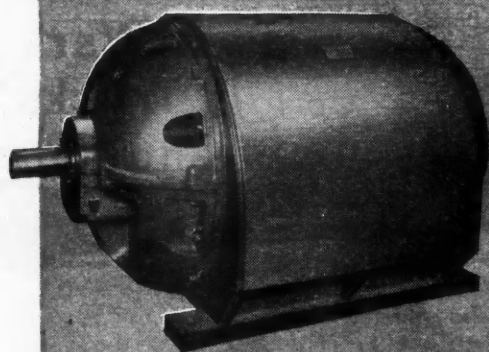
—Available with either sleeve or ball bearings—in dust-tight housings. Sleeve-bearing design is a further refinement of well-proved Tri-Clad motor bearing proportions, efficiently lubricated, with "air seal" to insure oil tightness of the housing.

The Tri-Clad, in its wide range of types and sizes, is G.E.'s most widely used (integral-hp) motor. Chances are that there's a Tri-Clad to meet your requirements "on the nose." For information on General Electric's complete line of Tri-Clad motors, ask for GEA-3580. General Electric Company, Schenectady 5, N. Y.

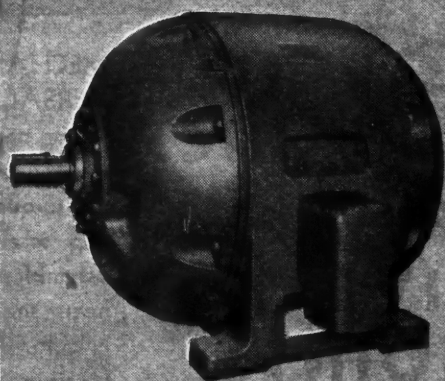
*Trade-mark reg. U.S. Pat. Off.



Typical large-size sleeve-bearing Tri-Clad poly-phase motor, now standard up to 2000 horsepower.



Modified cast-iron frame construction used for certain large sizes of the extended Tri-Clad motor line.



Separable housing construction used for large-size ball- or roller-bearing Tri-Clad motors. Roller bearings are standard at coupling end.

GENERAL ELECTRIC

Hudson Motor Car Co. has not announced any plans for factory expansion and it is likely that none will be undertaken, since the company apparently has ample capacity for a considerably increased volume over immediate pre-war levels. Hudson expects to return to the 300,000 car year peak it hit last in the late 1920's, according to A. E. Barit, president, and the company's facilities for building about 60 per cent of all components required should allow production considerably above the figure of approximately 80,000 units built in 1941.

Chrysler Corp., while undoubtedly

committed to a respectable outlay of cash for expansion, declines to divulge details of projected plans at present. The thinking discernible among some corporation officers appears to be one of watchful waiting for economic developments. However, there is no doubt that Chrysler will be ready to reap its share of any expanded market and despite official silence on new facilities, enough new construction is visible as external evidence to indicate plenty of forward thinking. It appears that a new Dodge main plant is going up, and that additions are being made to the Dodge truck plant and to the

Chrysler-Jefferson unit. Also, a small tool shop is being built at DeSoto and considerable remodeling is underway at the Plymouth plant. So far as can be determined, Chrysler has no plans for decentralizing its operations. The Plymouth assembly plant at Evansville, Ind., and the Los Angeles plant where Plymouth cars and Dodge trucks are assembled are the only automotive production units Chrysler maintains outside the Detroit area.

While moving ahead with production plans, the industry is not overlooking the importance of engineering research and development. Principal interest in this field, or at least the most noticeable, is centered on the new General Motors Technical Center which will be built on a 350-acre site just north of Detroit. The chief objective of the development will be research into new products and improvement of both production and quality of existing ones. The problem of improving production efficiency lost during the war will be one of the first and most important projects undertaken. The General Motors proving ground is being rehabilitated and modernized after gruelling punishment from testing war vehicles and will be maintained separately. All GM divisions, however, will retain present engineering functions they have carried on in the past and still will be responsible for their own product engineering.

Ford Motor Co. has overhauled its engineering and research activities to put all such activities under one division headed by R. H. McCarroll, executive engineer. William S. James, formerly chief engineer for Studebaker, has joined the Ford organization and will coordinate all research engineering functions as director of automotive research. The staff has been enlarged to include more research engineers and to achieve closer coordination between the engineering, sales, and production departments.

Diesel Production At Fairbanks-Morse

(Continued from page 38)

is shot-blasted, inspected for dimensional accuracy, and all welds inspected for soundness, size, etc. Magnaflux inspection also is employed for the detection of harmful cracks. Following inspection the blocks are given a stress-relieving treatment in a large oven. This is done primarily to correct the alignment of the structure for machining—to provide for the close machining tolerances and to fit properly in the fixtures. The block is shot-blasted again, after removal from the oven, and Magnaflux inspected to detect such cracks as may develop in the stress-relieving process.

The foregoing is a brief summary of the fabrication of the large block and, naturally, does not begin to do justice

(Turn to page 114, please)

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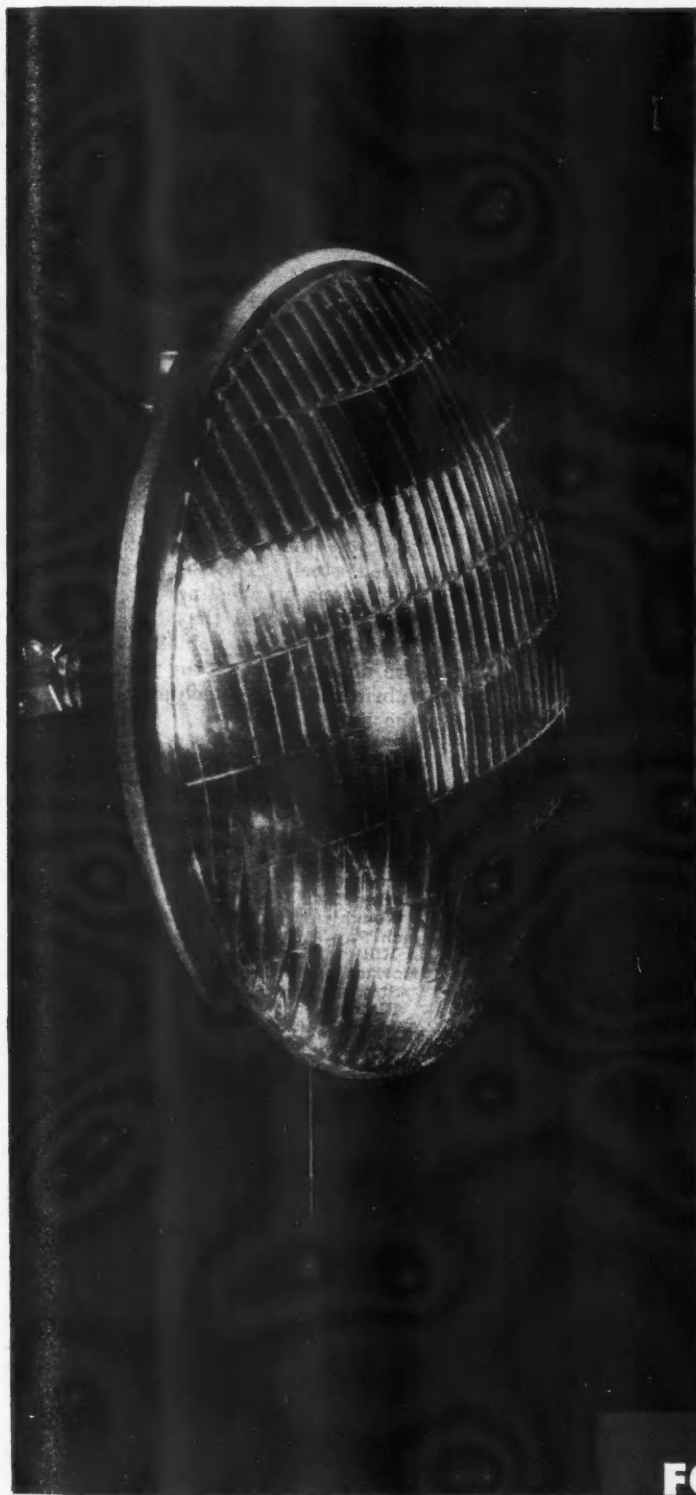
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to the great amount of experimental work and know-how in welding procedures brought to bear on this problem.

It is of interest to find that the piston, although outsize so far as automotive practice goes, is machined in conventional manner at the Freeport plant. It is made of nickel alloy cast iron, annealed and sand-blasted at the foundry. First operation is facing and centering of the head end on a J & L turret lathe. First rough turn and facing of the inside of the head are done on a Fay automatic lathe. The Fay also is used for the second rough turn. Boring and facing are done on

a Potter & Johnston. The compression end is recentered on a J & L. Finish turning, finish facing, and roughing of ring grooves are on 12 by 21 Fay automatics. A Barnesdrill is used for drilling and counter-boring of four holes.

Following these preliminary operations the taper of the skirt and taper of ring grooves are formed in two separate operations in Norton grinders. Semi-finishing and finishing of ring grooves and other details is handled in W & S turret lathes. This is followed by various detail hand operations, then the pistons are tin-plated selectively since certain areas are not coated. Final operation is that of drilling a

group of 40 7/32 in. holes and 20 3/32 in. holes in a special three-spindle horizontal drill press built by Rehnberg and Jacobson.

Some comment can be made regarding the selected views in the pictorial section. First is the panoramic view of the erection floor showing the assembly of big engines. This is a far cry from the mechanized assembly lines found in passenger car plants but involves even greater care and attention to detail, at a slower pace, with the complications incident to the greater size and weight of individual parts. The enormous bulk of the main frame—as contrasted with automotive engines—demands machining equipment of special nature. Here, for example, is the large Cincinnati Hypo planer for machining the top and bottom; the boring of bores for cylinder liners in the horizontal Moline boring machine which finishes three bores at a time; the line-boring of cam- and crank-bearing lines in the huge horizontal Moline boring mills.

The cylinder liner assembly consists of two major parts—the liner casting and the liner sleeve which is made of rolled steel. The sequence of major operations on the liner is given below. It may be noted that the final operations of honing, grinding, and facing are done following the pressing of the fabricated and machined sleeve onto the liner.

Routing for Cylinder Liner

OPERATION AND EQUIPMENT

Rough turn (2) spots for fixture, rough turn for wall thickness between ports and cut off (1) end—22-inch Monarch Lathe.

Rough bore and face ends 1/4 inch long from ports—Moline Vertical Double Head Boring Bar.

Rough turn and form radii and ports—20-inch Fay Automatic Lathe.

Mill water passages—No. 3 Cincinnati Horizontal Mill.

Stress relieve—Electric furnace.

Finish turn spots for fixture—22-inch Monarch Lathe.

Finish bore, ream, face and chamfer—Moline Boring bar.

Finish turn OD, groove and form fillets—22-inch Monarch Lathe.

Drill and spotface (4) 11/16 inch holes, drill and tap (2) 5/8-11-3 holes in flange and ream (1), 11/16 holes for location—4-foot American Radial.

Mill (4) 1 1/4 dimension injection nozzles and (4) 19/32 water passage slots—No. 3 Cincinnati Horizontal Mill.

Grind OD for jacket—14 x 72 Cincinnati Grinder.

Water test for leaks, hand grind air and exhaust ports, hand grind water passage, slots, ribs and flanges before assembly of jacket.

Drill (4) 1-inch holes, drill (4) 1-5/32 inch holes, ream (4) 1.172 holes, form (4) 1 1/4 inch seats, tap (4) 1 1/4-12 thread, chamfer and polish seats—4-foot American Radial.

Press jacket on liner—Hydraulic press.

Hydro test.

Hone Bore—No. 4014 Barnesdrill Honing Machine.

Grind OD complete—14 x 72 Cincinnati Grinder.

Face bottom of flange, face end of jacket, form angle for port clearance and bore relief—22-inch Monarch Lathe.

Second water test, file hand tap and burr, inspect stock.

Obviously, this treatment is much too brief. However, it is hoped that the word picture together with the excellent illustrations will enable the reader to visualize the scope of activity.

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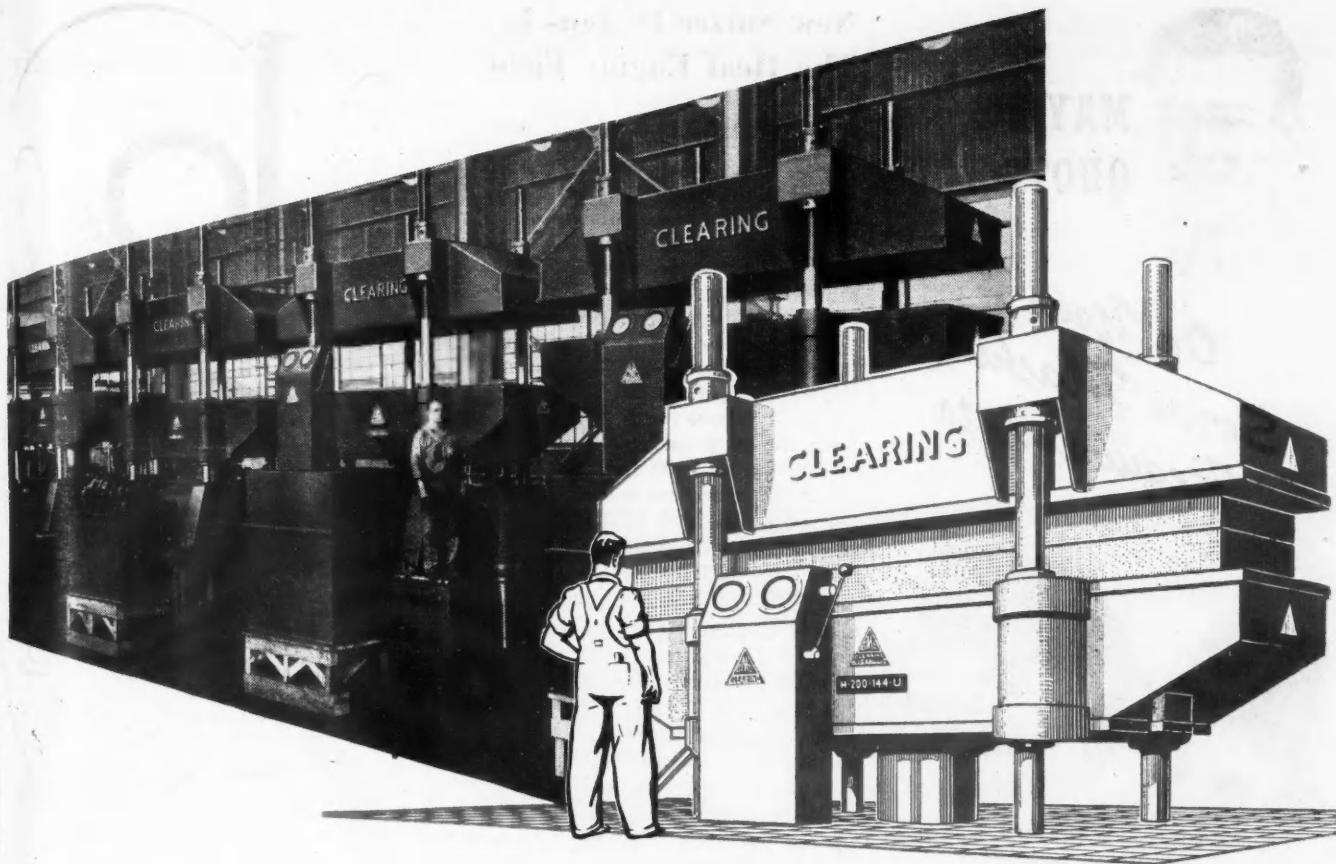


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ing hydraulic press design to meet production needs. The completely automatic work cycle requires a press dwell at 200 tons for one hour, a pressure increase to 400 tons for a period of twenty minutes, and finally, a reduction of pressure to 200 tons again for a dwell of two hours.

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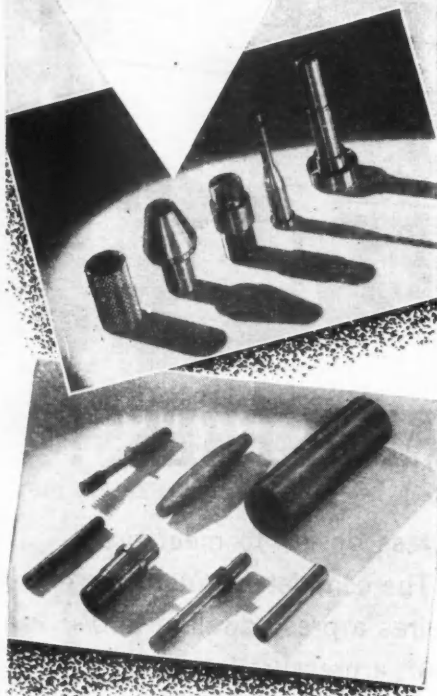
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New Sulzer Designs in The Heat Engine Field

(Continued from page 96)

mitted to thorough trials on the testbed. The engine has six cylinders of 180 mm (7.1 in.) bore and 2 x 225 mm (8.85 in.) stroke, supercharging pressure 2 atm abs, mep. 171 psi, 850 rpm, 1560 bhp hourly rating, weight 17 lb bhp. A similar engine has been built in extra light weight welded steel design. This 8-cylinder unit, of the same bore and stroke as above, with a supercharging pressure of 35 psi abs giving a bmep of 200 psi at 1000 rpm and 2850 bhp, one hour rating, will be ready for the testbed at the end of the current year. Its weight will reach the remarkably low figure of 7 lb bhp (hour rating).

A Sulzer free-piston power-gas plant also is running on the testbed. It comprises 3 free-piston power gas units of 15% in. with stroke adjustable from 2 x 23½ in. to 2 x 26 in., 350 cycles per min, mep 225-285 psi, 7,000 bhp total output, a precompressor set (consisting of auxiliary turbine and precompressor) and a power-gas turbine. The electric generator is replaced for the time being by a water brake so that the whole plant can be tried out both as a stationary power plant with constant generator speed and as a marine plant loaded according to the propeller law. This plant will shortly commence the main and continuous trials of a comprehensive program, the three power-gas producers having already been tested individually and in combination.

A reference to the theoretical thermal relationships between two-stroke supercharging, the power-gas process and the gas turbine with combustion at constant pressure was already made by Sulzer Brothers in the above-mentioned special number of the Technical Review on the supercharging of the two-stroke Diesel engine, and in the same connection the development of such a gas turbine on their own system was mentioned. The special feature of the Sulzer gas turbine consists in the employment of a new type of circuit which retains the essential advantages of the known closed circuit without being burdened with its main disadvantage, i.e., a large and heavy air heating chamber. The Sulzer air heater used instead is considerably smaller and lighter, which makes the plant particularly interesting for marine propulsion. The thermal efficiency exceeds that of the best marine steam turbines even at small powers, and with full utilization of all present advantages and inherent possibilities it will be raised very near that of the Diesel engine. The trial plant of such a marine turbine to give an effective output of 7000 hp is at present under construction.

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Strikes in Feeder Plants Still Trouble Industry

(Continued from page 42)

more than 300,000 GM workers, hint of what may be in the wind is revealed by re-examining the original demands proposed by Reuther on Aug. 19. Actually, if the demands were to be granted, it would not amount to a flat 30 per cent boost in hourly rates straight across the boards. Part of the increase would be earmarked for use in eliminating geographical wage differentials throughout the corporation in favor of "equal pay for equal work" wherever performed. In addition, a sum equal to 3 per cent of the payroll would be allotted to a social security fund which is designed to furnish union members with death benefits and complete coverage with health, accident, medical, and hospitalization insurance. It should be noted that under this last proposal, the corporation would pay the entire cost, but that full administration would be in the hands of the unions with only union members participating. The three per cent would not be in the form of a payroll deduction, but would be paid by the corporation directly into the union-administered fund, and although only union members could benefit from the fund, the three per cent would be based on the total weekly wages of all workers in each plant under contract with the UAW-CIO. Consequently, a simple majority of the workers—say 51 per cent—could reap the benefits accrued through a levy on all workers, but the other 49 per cent would have no claim. The implications are obvious.

The questions of guaranteed annual wages and paid sick leave, both of which have cropped up in union discussion during the last year, were not included in the demands made by Reuther, although he did propose that GM take the lead in calling an industry-wide conference to negotiate wage demands on an industry-wide basis, at which time the annual wage problem could be discussed. GM, however, turned down the proposal with the statement that industry wide bargaining is a barrier to free competition and that it adversely affects the interests of the people as a whole.

Despite the recession in strikes and related stoppages, there is no discernible optimism among management that the situation is in hand. Frank Rising, general manager of Automotive and Aviation Parts Manufacturers Association, points out that although the oil strike was terminated through government seizure, nothing was settled. He characterized Labor Secretary Schwelb's efforts at conciliation as a "great blunder," since it was at once obvious that any offer made by any company in attempting to settle a wage issue would be used as a starting point in an arbitration proceeding dictated by a biased governmental group.

"This single ill conceived move was the hardest blow ever dealt to that sense of fair play which must underlie collective bargaining, if we are to have any," he said.

Mr. Rising stated that four great misconceptions confuse the thinking of many top politicians: 1. That the militant, rowdy leaders of strikes represent "the people." 2. That the Department of Labor is an impartial Labor Relations Agency. 3. That excusing the incompetence of Government Agents will continue, and 4. That "Labor" is the party with the only really pressing and meritorious complaints in the management-labor field. "We face a most ter-

rible important period," he said, "with little sign of experienced, mature judgment in high places.

"Union responsibility is a fundamental and serious problem underlying the surface clamor for wage increases," he continued, "and the public must realize that a corresponding increase in production must accompany any wage concessions." He predicted little worthwhile accomplishment by the forthcoming management-labor conference in Washington. The only solution, Mr. Rising stated, is legislation to guarantee the sanctity of contracts and to impose responsibility for performance.



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Death Dealing Demands of CIO

(Continued from page 15)

without profits, the conclusion seems to be inevitable that the wage increase must be passed on to the consumers unless, since 1941, productive efficiency has increased greatly, so that the number of workers required to make a million cars has been greatly reduced.

Reports from automobile factories indicate, however, that exactly the reverse is true—that, in fact, production per man hour is down at least 25 per cent. If such is the case, it seems evi-

dent that to include a 30 per cent wage advance, car prices will need to be advanced some 60 to 75 per cent above the 1941 level.

Thus, if we assume that in 1941 the labor cost on a car was \$500, the total labor cost on 1000 cars would be \$500,000. If, in 1945 the United Auto Workers push the price of labor up to \$1.65 per hour instead of \$1.11 paid in 1941 this will make the total labor cost \$745 per car or \$745,000 for 1000 cars, in-

stead of \$500,000 paid for labor in 1941. If, however, by loafing on the job, workers turned out only 745 cars instead of the former 1000, labor cost per car would be advanced to \$1,000 instead of the \$500 prevailing in 1941. This would mean that the manufacturer would be compelled to raise the price of the car at least \$500, and the retail dealer might charge for it \$600 more than the old price. But here the OPA steps in and demands that prices be kept down.

It is not unlikely that the CIO can overrule the OPA, but it will have more difficulty in overcoming the law of supply and demand. The total demand for automobiles depends upon the net volume of new spending power in the nation—that is upon the algebraic sum of the realized national income and any change occurring in the volume of money and bank deposits in circulation. In 1944, our people had about \$174 billions of new spending power. Of this, \$21 billions represented currency inflation. It is to be hoped that inflation will be much smaller in 1945 and 1946. If so, the public will have less money to spend, and buying will therefore tend to slacken unless prices are kept down.

The attack on the motor industry is merely the opening gun of a general battle for higher wage rates in all industries. If the CIO wins this fight, there is grave danger that it will produce a repetition of the 1929-1932 crash, with mass unemployment in most industries. If it does this, a general cry will go up that private enterprise has failed, and that government must intervene. Presumably, the first step will be to start a huge public works program, financed by inflation. This procedure will gradually rob the thrifty of what value remains in their life insurance, bonds, mortgages, and bank deposits, after the squeezing process of the last decade. Little by little the Government will take over, and the ensuing socialistic regime will doubtless crush the CIO and other unions as effectively as has been done in Russia. Not satisfied with its almost complete dominance of the nation for a decade, the CIO will have wrought its own destruction.

Dodge Truck Production

Truck production schedules at Dodge Div. of Chrysler Corporation for the next nine months are based on a production rate substantially larger than the average annual truck output during the five years preceding the war, according to L. F. Van Nortwick, director of Dodge truck sales. Production projected for the rest of this year is materially in excess of that in any previous three-months period in the history of the company.

Conversion of assembly lines from military to commercial truck production was accomplished in two hours, according to L. J. Purdy, vice-president in charge of trucks, and if it were not for material shortages, full scale production could have begun immediately.

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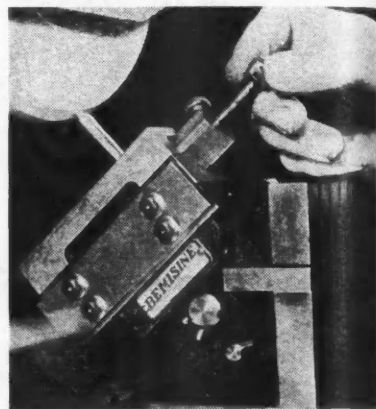
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New Products

(Continued from page 78)

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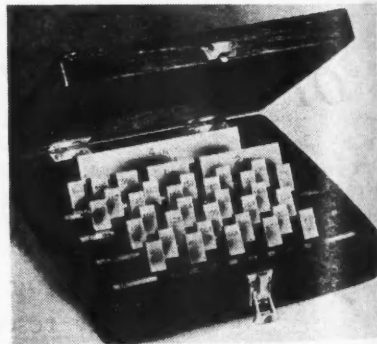
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ing, the sliding attachment can be removed from the sine-angle plate, leaving a working surface for holding small parts at accurate angles for grinding, milling, or jig-boring operations.

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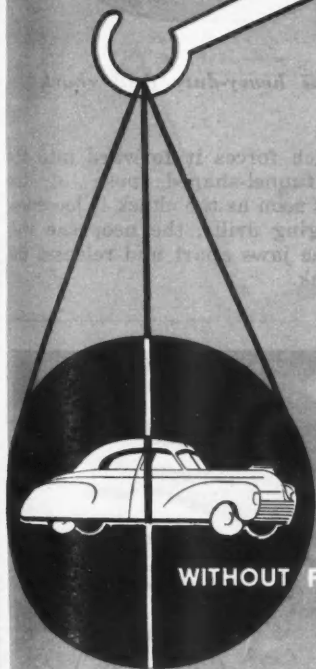
Latest product of the Fonda Gage Co., Stamford, Conn., is a complete set of tungsten carbide gage blocks. The set contains 35 pieces ranging in size from .100 in. to 4.000 in. The gage blocks meet Bureau of Standards requirements, and are available in three grades—"AA", "A" and "B". They are produced in all grades to a finish .2 to .4 micro in. rms.

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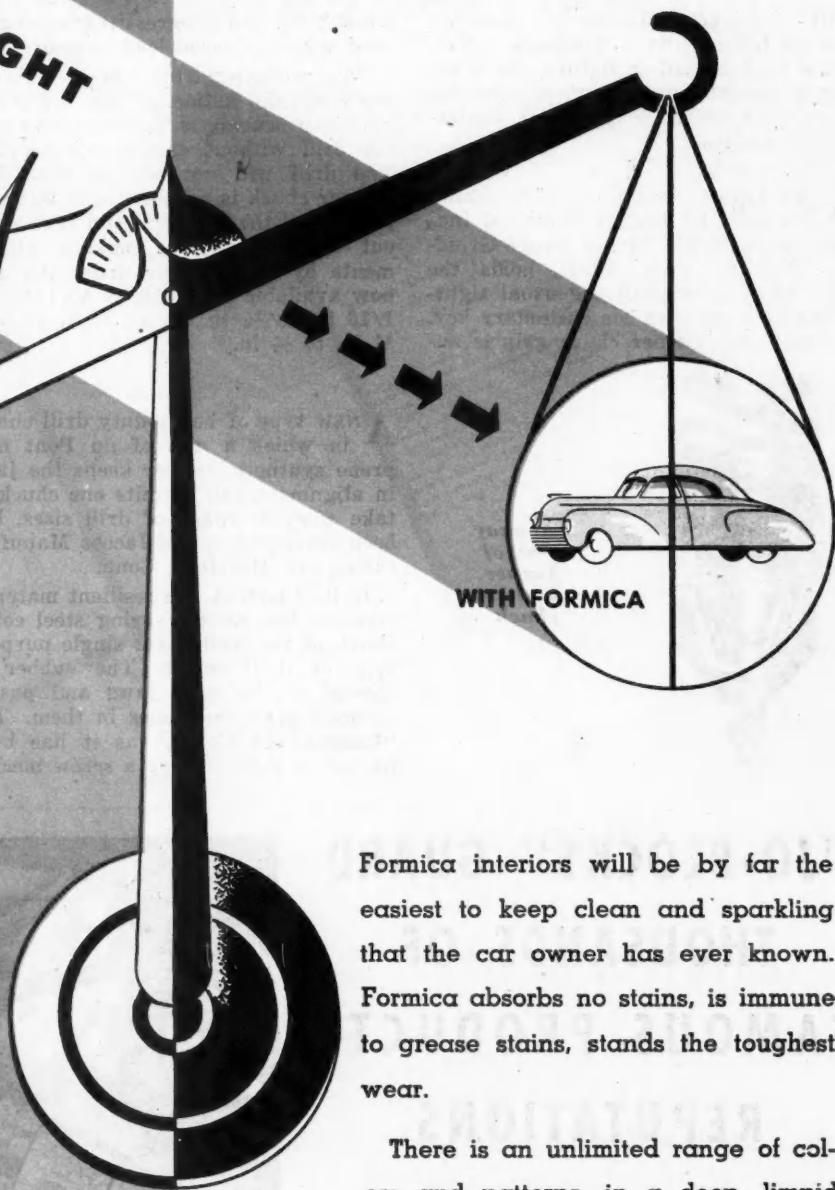
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NEW PRODUCTION EQUIPMENT

(Continued from page 54)

drill eight holes 17/32 in. diameter and six holes 39/64 in. diameter. Then, while part is still in fixture, six drills are replaced by six reamers to ream the holes to .6245 in. Magic quick change chucks are used.

A NEW keyless chuck, now being manufactured by Turner Brothers, Inc., affiliated with the Turner Gauge Grinding Co., Ferndale, Mich., holds the drill securely without the usual tightening by hand with the customary key. Further, the Turner chuck grip is au-



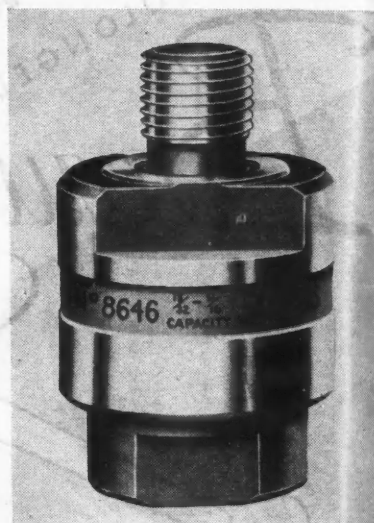
Cut-away view of Turner keyless chuck

tomatically and progressively strengthened with increased load pressure.

This self-energizing chuck tightens itself by the action of the drill, and hardened bearing steel roller-jaws grip the drill without chewing or scoring. The drill will not slip in use. The Turner chuck is automatically self-centering and the drill will run true without the necessity of making adjustments by hand. Four drill capacities now available are 1/32 in. to 1/16 in., 1/16 in. to 1/8 in., 1/8 in. to 1/4 in. and 1/4 in. to 1/2 in.

A NEW type of heavy-duty drill chuck, in which a web of du Pont neoprene synthetic rubber keeps the jaws in alignment and permits one chuck to take a wider range of drill sizes, has been developed by the Jacobs Manufacturing Co., Hartford, Conn.

In its function, the resilient material replaces the flexible spring steel collet shank of the traditional single purpose type of drill chuck. The rubber is bonded to the steel jaws and passes through anchoring holes in them. The "Rubber-Flex Collet," as it has been named, is tightened by a screw mecha-



Jacobs heavy-duty drill chuck

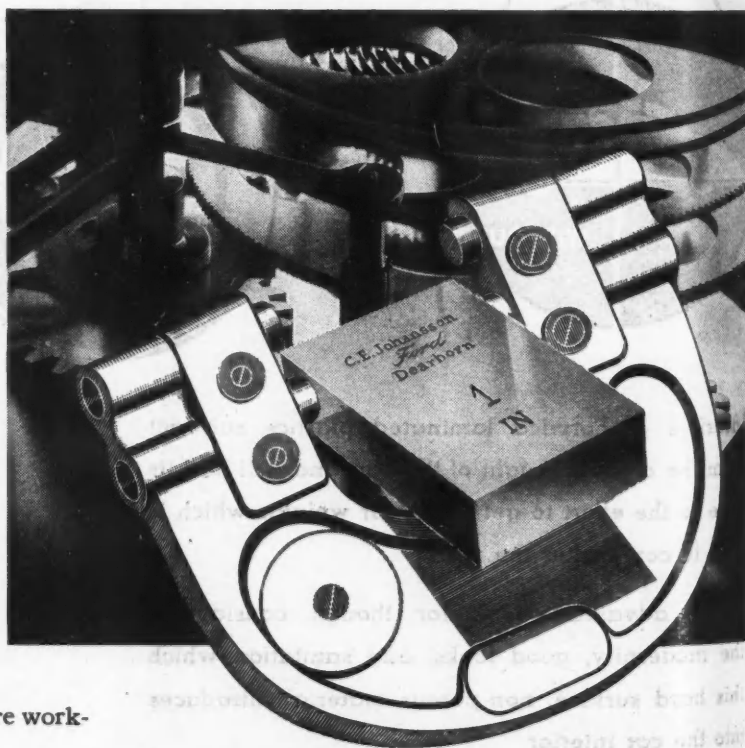
nism which forces it forward into the smooth funnel-shaped nose of the chuck. As soon as the chuck is loosened, for changing drills, the neoprene web pushes the jaws apart and releases the drill shank.

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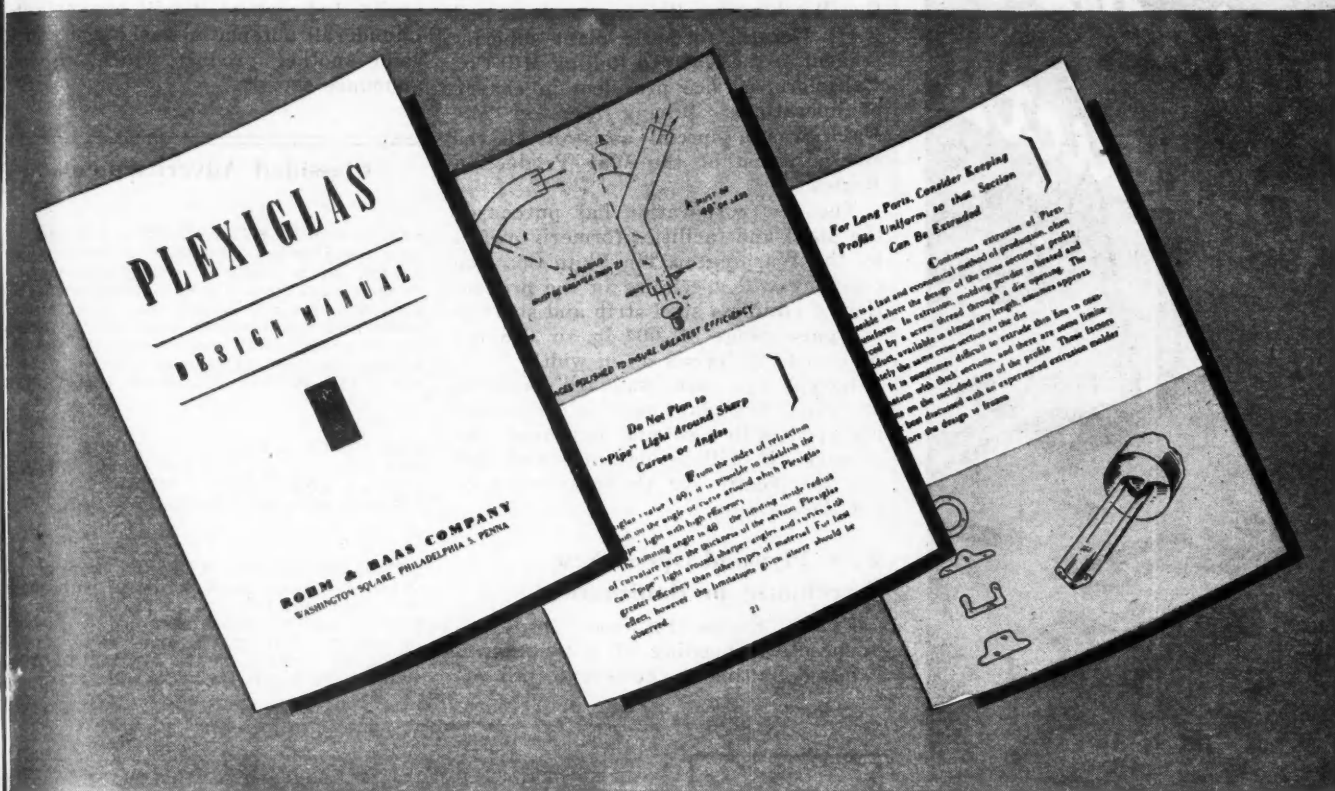
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New Company to Produce Stainless Steel

The Washington Steel Corp., a new company that will produce stainless steel in both sheet and strip form, was formed Oct. 10 at Washington, Pa. T. S. Fitch, formerly manager of the Composite Steel Division of the Jessop Steel Co., Washington, Pa., is president, and F. G. Gerard, formerly plant superintendent of the Eastern Rolling Mill Co., Baltimore, is vice president in charge of operations. During the war Mr. Fitch was a special assistant in the steel division of the War Production Board.

The new corporation has purchased the plant and facilities formerly owned by the Washington Tin Plate Co. The company will specialize in the production of stainless steel strip and sheet in the gage range of .004 in. to .078 in., and up to thirty-six in. in width.

Except for such standard facilities as cranes the plant will be completely equipped with new and improved machinery. It will be designed and laid out specifically for the production of stainless steel.

U. S. Plywood Opens New Warehouse in Baltimore

United States Plywood Corp. announced the opening of a new warehouse in Baltimore, the seventeenth dis-

tributing unit in its nation-wide chain. The latest unit, located at 2020 Mosher Street, is under the supervision of of Thomas S. Hauck.

Jacobs Buys New Plant

F. L. Jacobs Co., Detroit, announced that it has acquired a plant in Indianapolis, Ind., where it will assemble its Launderall automatic washing machine "and another product which we will announce shortly."

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